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OCTOBER 29, 1887.

THE AMERICAN ARCHITECT AND BUILDING NEWS

VOL. XXII. REGULAR EDITION NO. 618.

ARCHITECTVRE

ENGINEERING

DECORATION

CONSTRVCTION

TICKNOR & COMPANY

BOSTON MASS.

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REVIEW OF THE PRINCIPLES OF SANITARY PLUMBING AS NOW ACCEPTED BY ALL LEADING SANITARIANS.

THE main object to be attained is the complete removal of waste matters from the premises the instant they are generated. This can only be accomplished by observing the following rules:— (1.) Avoid all cesspools. (2.) Make all waste-passages as small as possible to effect their purposes. (3.) Construct every fixture on the principle of the flush-tank. (4.) Make every trap seal-retaining and self-scouring. (5.) Make all joints tight. (6.) Select the simplest appliances and the simplest system consistent with safety. These rules are self-evident enough to be accepted as plumbing axioms, and are sufficient to produce perfect work. The "Sanitas" Appliances have been constructed with a view to their fulfilment in every respect, and an examination of the steps leading to the development of these appliances will best illustrate the principles of Sanitary Plumbing, showing the faults which should be avoided, and the objects which should be sought.

Beginning with the trap: In the first place mechanical seals have been discarded as being unreliable, unnecessary, and as obstructing the water-way. We start with the simplest form of water-seal trap, the ordinary S-trap. This

trap answers all our requirements except that it has no power to retain its seal under the variations of atmospheric pressure occuring within the waste-pipes. To remedy this deficiency the pot-trap was developed from the S-trap by simply enlarging its upcast limb, a sufficient enlargement gives it a temporary power of resistance, but creates a cesspool having no self-cleansing power

and, accordingly, the trap clogs, under sinks, with grease and ultimately loses its original resisting power. To avoid this difficulty we have turned the pot-trap on its side and reduced the size of its body. This permits the air to pass through the trap above the water without driving the latter out

before it, as would be the case with a perpendicular body equally reduced in diameter. To still further increase the power of resistance to siphonage the body was next bent into a quadrangle, giving several reflecting surfaces, which throw back this water under siphoning action while they allow the air to escape, and, finally, the two parallel sides of the quadrangle were merged into a single body having a reflecting partition and a large clean-out cap. This gives us the perfected Sanitas-Trap, which

has proved itself to be both anti-siphonic in properly arranged plumbing-work and substantially self-cleansing either with or without venting. It is more resisting than a vented S-trap.

The Sanitas is a Scientific System of Plumbing, having Simplicity and Safety for its Basis. It is also by far the most Economical System

SANITAS

APPLIANCES

PLUMBING

Avoid Infringements and Imitations which are described as being "as good as the 'Sanitas;'" they are not, they are very inferior as well as illegal.

Considering next the Lavatory. These should always be constructed on the principle of the flush-tank, their discharges filling the water-passages "full-bore," so as to keep them clean. The overflow and outlet passages should be combined in the form of a stand-pipe, thus doing away with the usual foul, inaccessible and badly jointed lead overflow-pipe, and the troublesome and dirty plug and chain. The stand-pipe should be operated by a simple mechanism above the slab, for convenience and cleanliness, requiring but a single movement of the hand, and all parts should be of solid and durable construction, while the stand-pipe should be easily detachable for cleansing. The Sanitas Lavatories are all constructed after this principle, and they are the first ever so constructed. The stand-pipes are made of either plated metal or of earthenware, like the fixture itself, and the whole device produces a very ornamental effect, especially when decorated in colors to correspond with the decoration of the earthenware bowl. Finally, the ideal water-closet should have the simplicity of the short-hopper, with the sanitary advantages and convenience of the improved modern closets. More than this, it should be practically noiseless, anti-siphonic, quick-acting, self-sealing, and free from spattering or waste of water. These desiderata have been attained in the Sanitas Water-Closet of which we sketch the outline in section. The supply-pipe between the cistern and the closet discharges into the latter below the level of its standing water, and being without air-pipe, stands permanently full of water, hence the action is instantaneous and the noise of flushing is deadened. This and the peculiar construction of the flushing-rim and water-supply passages cause the waste to be discharged with wonderful speed and effectiveness; and at the same time so quietly that with the cover down and the toilet-room door closed, no sound of flushing can be heard from without. The closet is highly ornamental in appearance, hence no other wood-work is required than the seat and cover, and these may be supported directly on the earthenware itself, which is constructed with this in view. The Sanitas System, taken together, is the most economical as well as the only safe system of plumbing, as avoiding the dangers and complication of special trap venting. Whether vented or not it is now admitted that safety requires a trap to be *anti-siphonic*, the vent-pipe alone not being reliable. The Sanitas Trap holds sufficient water to resist, when properly set, any *back pressure* that can occur in good plumbing with properly vented soil-pipes. For more detailed description and illustration of the Sanitas Appliances, see our other Advertisements and the Circulars of

THE SANITAS MANUFACTURING CO., BOSTON.

T. H. DUGGAN, 141 Dartmouth Street, BOSTON, MASS. TELEPHONE, 4188 — Will execute anywhere, in first-class manner, small or large contracts for **PLUMBING**

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

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OCTOBER 29, 1887.

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TWO distinguished French architects have recently passed away. One of these, Daniel Ramée, who died in September last, at the age of eighty-one, was one of the most industrious and useful of the older men in the profession. Although a thorough artist and archæologist, he was also a most practical and sensible constructor, and, in addition, an accomplished man of letters. To his skill in archæology, and his appreciation of the beauty of mediæval work, he owed his appointment to the charge, successively, of the restorations of the Cathedrals of Noyon, Senlis, Beauvais and Abbeville, four of the noblest works which the thirteenth and early fourteenth century produced. During the few leisure hours which these important commissions left him, he found time to write some extremely useful books, on a variety of professional subjects. The best known of these is perhaps the "*Historie Generale de l'Architecture en France*," covering the Romanesque, Mediæval and Renaissance periods. This was followed by an admirable little work on "*Architecture Pratique*," and a dictionary of technical terms in French, English, German and Italian. The other architect whom the profession has to mourn is M. J. M. A. Le Soufaché, a man particularly noted for his success in the design of private houses, but highly esteemed also among his brethren for his accomplishments and honorable character, who died recently at the age of eighty-three. According to *La Semaine des Constructeurs*, he was at one time associated with M. César Daly in the editorial management of the *Revue Générale de l'Architecture*, and, after his graduation at the School of Fine Arts, was engaged in teaching at the school, as assistant to his patron, Duban. On entering, later, into active practice, he soon gained a high reputation, and, as M. Daly says, he may be considered the veritable founder of modern house planning, with its complex adaptations to the material wants and habits of the present day. He received in 1874 the prize of the Société Centrale des Architects for domestic architecture, and was for many years prominent in that Society, holding various offices in it. By the public authority his merit was recognized in his appointment as one of the permanent jury of the School of Fine Arts, and by the decoration of the Legion of Honor.

LA SEMAINE DES CONSTRUCTEURS raises a question of great importance to builders, and in a less degree to architects and owners. One of its correspondents writes that he had made a contract with a builder for some important work, to be carried out on an estate which has not yet been provided with a water-supply of any kind, not even a well existing on the place, and that after all the papers had been signed and materials brought together for commencing the work, the builder had surprised him by demanding that he should be furnished with a supply of water for building purposes. Most of us know the shock which a proprietor experiences at learning of such extra demands after he has signed his agreement, and *La Semaine's* correspondent asks whether he is bound to comply with the request, or whether the builder's contract does not imply that he is himself to furnish water as well as the other materials for his work. The reply, which in this case is furnished by that most experienced and judicious writer on practical matters of business, M. Detain, shows that the question of water is regarded in France just about as it is here, and what is law there is certainly good precedent in this country.

IN brief, he says that the furnishing of the water necessary for their work is generally held to be the duty of the contractors. They are paid for their mortar, the cost of which enters into their estimate, and they cannot collect an extra charge for the materials required for making the mortar. If the circumstances of the locality in which the work is to be carried on are likely to make it difficult to procure water for building, it is for them to ascertain the fact, and consider the increased expense in their estimate, just as they would consider difficulties of transportation, or any circumstances likely to affect the cost of the other materials to be used. In most cases of the kind, the contractor would simply dig a temporary well, which is not a very serious matter, and would, if he were experienced in country building, include the probable cost of this in his estimate, but it happens sometimes that a city builder, who has been accustomed to have a service-pipe carried from the street-main into the cellar, and to pay only for the water used, forgets that water is not always so easily obtained in remote country districts, and, when he discovers his omission, tries to remove to the owner's shoulders the responsibility for his own carelessness. With us the water question is often of very great importance. We once knew a case where a public water-supply had been introduced into the town where a certain building was to be erected. After the manner of Water Boards, many promises had been made that the mains should be laid at once in the street passing by the property, and a service-pipe put in. The builder trusted these promises, as did also the owner, but the latter warned the contractor that he would not guarantee the promises of the Board, and, in the end, the unfortunate builder was obliged to bring all the water which he used in barrels from a spring at a considerable distance.

THE advantage of knowing something about a subject seems to us to be exemplified with unusual plainness in certain points in the report of the Park Commissioners of Boston for last year. The Boston Park Commission has for several years employed Mr. Frederick Law Olmsted as its professional adviser, and the wisdom of its choice is every year more fully shown. Among the other difficult problems presented to Mr. Olmsted for solution was lately one in which he was requested to devise a method of utilizing as a public park a strip of ground bordering on the river, or inner harbor. The territory slopes gently to the water, but is very narrow, directly exposed to the fierce northwest winds of winter, and has a background of manufactories and shabby houses. To convert this region into a beautiful public park would puzzle most persons, but Mr. Olmsted, with characteristic originality, invented a method of dealing with it which is worth remembering. Obviously, the water view presented the most attractive feature of the plan, and this was taken advantage of by the provision of a promenade, half a mile long, directly at the water's edge. Between this and the city tenement-houses flowers would hardly grow, on account of the exposed situation, while grass would soon be worn into shabbiness by the rather unruly population of the district. Nothing in the way of available vegetable ornament was left but trees, and Mr. Olmsted therefore planned to have the whole space between the promenade and the boundary of the park on the city side filled with trees, forming a sort of picnic grove, which could dispense with grass, and yet be beautiful, as well as useful in screening the promenade from the city dust and noise. To avoid too much monotony, an open space is left at each end of the long grove, in one of which

women and children will find opportunities for play and exercise, while the other, nearly half a mile off, is devoted to gymnastics for the rougher sex, which will thus be kept away from the women's and children's quarter. Nothing could be simpler, or more obviously sensible and suitable, than this scheme, and yet, simple and appropriate to the circumstances as it is, there are very few men in this country, not more than three or four, we should say, who would have thought of it, or who have even any notion of the professional tact and experience needed to solve such a problem so perfectly, and with so little affectation.

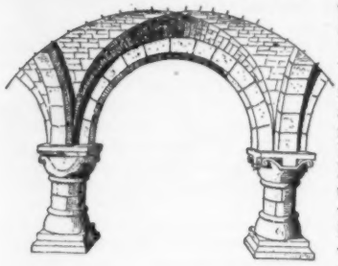
THE *Revue Industrielle* gives a table, copied from *Engineering*, of the proportions of ingredients in various high explosives. The ordinary dynamite, as most persons know, consists of three parts of nitro-glycerine to one of "fossil meal," a fine, soft earthy deposit, consisting mainly of microscopic shells. Dualin contains eight parts nitro-glycerine to two parts of gun-cotton; "rend-rock," or "lithofracteur," has forty parts nitro-glycerine, and forty of saltpetre, to thirteen parts of cellulose, and seven of paraffine. Giant powder contains thirty-six parts of nitro-glycerine, and forty-eight of saltpetre, to eight of sulphur, and eight of charcoal. "Hercules powder" is made of seventy-seven parts nitro-glycerine to twenty of carbonate of magnesia, with a little cellulose and nitrate of soda. Blasting gelatine consists of ninety-two per cent of nitro-glycerine, in which eight per cent of gun-cotton has been dissolved; and "forcite" gelatine contains about the same amount of nitro-glycerine, combined with ordinary cellulose. The American explosive known as "Rackarock," which was used with success in the Hell-gate excavation, differs radically from nearly all others, being made of seventy-seven parts of chlorate of potash to twenty-two parts of nitrobenzol. Either ingredient is tolerably stable when kept by itself, and in use the two parts are sent out separately, and mixed as wanted. A very singular use of high explosives has recently been made in France, in the course of the construction of the fortifications around Lyons. A portion of this work consisted of masonry, which it was necessary to lay on a foundation of soil filled with springs. The water came so rapidly into the excavations as to wash the cement out of the concrete put in for footings, and there seemed to be nothing to be done except to enclose the work with sheet-piling, and keep it dry with pumps. In this emergency Captain Bonnefont, of the Engineers, conceived the idea of forcing back the water from the trenches by the expansion of gases from exploding substances. He therefore had holes made in the ground with a long crowbar, about an inch and a half in diameter, and ten or twelve feet deep. In each hole was placed a string of dynamite cartridges, which were all fired at once. The explosion made a pit three or four feet in diameter around the hole, but the ground-water was forced far back in the pores of the earth, and did not begin to reappear in the excavation for half an hour or more. This gave ample time for the workmen to excavate the trench in the neighborhood of the pit formed by the explosion, and put in the concrete footings, which, by the time the water had again accumulated around them, had set sufficiently to be out of reach of harm.

WHETHER justly or unjustly, the French frequently accuse the Germans of counterfeiting trade-marks and other objectionable practices. The last account of the kind, which seems to be tolerably well authenticated, comes from the French journal *Métallurgie*. Not long ago, it seems, a certain German rolling-mill undertook contracts for furnishing steel rails to various roads at home and abroad. In Europe, as here, the railway companies appoint inspectors to examine new rails at the rolling-mills, test them, and reject all that fall below the standard required by the specifications. In this case, the inspectors, to make sure that their directions were followed, had private stamps made, with which they marked the rails which they found satisfactory. The directors of the mill, however, finding that their profits would be increased if they could palm off inferior metal on their customers, devised means for evading both the tests and the marks. One of the severest trials to which the rails were subjected consisted in letting fall upon them from a height a heavy block of iron. For this test the rail to be tried was placed on supports, and it seems that cushions of India-rubber were introduced into the supports, where they could not be seen, but served to lessen very materially the shock produced by the falling body. Not content with this evasion of a serious test, the mill-proprietors had punches made, in imitation of those used by the inspectors, and utilized them for stamping the rails which the inspectors had rejected. As suspicion would have been excited if the number of rails marked had greatly exceeded that of those inspected, the mill-owners took the precaution to keep a number of good rails on hand for testing. When the inspectors were ready, these were brought forward, tried and duly stamped. As soon as the inspectors were gone, an equal number of bad rails were stamped with the counterfeit punches, while the genuine marks were filed out of the good ones, which were placed in a convenient position to be again tested, stamped and utilized for passing a fresh batch of bad material.

ONE of the most curious of the new safety devices which have been applied to theatres in Paris since the destruction of the Opéra Comique is an iron curtain, moved like a hydraulic elevator, which has just been put into the Theâtre Français. This is a small, but old theatre, probably not too solidly constructed, and it must have seemed particularly necessary to provide some efficient protection between the stage and the auditorium. This has been done in an admirable manner by the construction of a curtain, or rather, a screen, of sheet-iron, stiffened by a frame of iron bars and braces, and decorated by painting on canvas attached to it, and sliding vertically. The sides of the screen are secured to vertical shafts, which form the pistons of two hydraulic presses, exactly like those of a direct-acting water-elevator. On opening a valve, the water is admitted under the piston, and the curtain is raised; and another valve, or rather, a different movement of the same valve, opens the discharge pipe, and the shafts sink, carrying the curtain with them. All this is infinitely better than the old-fashioned iron or wire-gauze curtain, hoisted by a rope and windlass, but M. Edoux, the engineer of the apparatus in question, has made a further improvement of great value by arranging the valves in such a way as to be controlled by electricity, and a current can be sent from various places on the stage and in the auditorium, as well as from the outside, which will lower the curtain in case the persons appointed to that duty should, as happened at Nice, at Exeter, and in the Opéra Comique, forget or neglect what was required of them.

A REPORT has been printed in the newspapers, to the effect that the persons having in charge the matter of the new Episcopal Cathedral for New York had bought a tract of land on the West side of the city, as a site for the building. The rumor is now contradicted, although it seems quite possible that ground in the position mentioned may finally be selected. In point of fact, there are many fine sites for such a building in the upper part of New York. Just above the Central Park a rocky ridge runs north and south. The southern part of the ridge slopes rather gently westward to the Hudson River, but is bounded eastward by a precipice, overlooking the plain of the Harlem Flats. The flats are now nearly covered with handsome houses, but the precipice of rock cannot be built upon, and has been taken possession of by the city, a long parapet wall built, and the summit converted into what is known as Morningside Park. The high land on the top of the ridge, just back of the strip of Morningside Park, is occupied by two or three charitable institutions, an orphan asylum and a lunatic hospital being the principal ones. Either of these corporations would gladly sell their land, now become of great value by the increase of population of the city, and either site would be an admirable one for a great public building, which would be visible from Long Island and the New Jersey shore, as well as from the lower portion of the city. The elevated railway, the principal thoroughfare of upper New York, runs over a long viaduct, some seventy feet high, parallel with the precipice of Morningside Park, and would give an unobstructed view of the eastern portion of the great church. Next to this situation, perhaps the Jumel tract, three or four miles further up town, presents the greatest advantages, but Morningside Park is nearly in the centre of the Manhattan Island, and will soon be about midway between the great northern railway terminus and the steamer and ferry-boat landings at the south part of the town, so that it is particularly favorable on this account, independent of its topography.

AMERICAN INSTITUTE OF ARCHITECTS.



THE Institute's Twenty-first Annual Convention was called to order Wednesday morning in the rooms of the Chicago Literary Club in the new building recently erected by the Art Institute in Chicago, Ill. President Walter being detained by illness, the chair was taken by Mr. Edward H. Kendall, of New York, vice-president, who delivered the following address:

PRESIDENT'S ADDRESS.

Having known for only two or three weeks that, owing to serious illness, our esteemed president, Mr. Walter, could not be with us to-day, I can do little more than call you to order, and formally endeavor to perform the duties of chairman. I shall ask you, however, to undertake the business of this, our Twenty-first Annual Convention, with that especial dignity of bearing and soberness of purpose which would seem to be called for upon the attainment of our corporate majority, and will remind you that we are called together, in this great and prosperous city, for the purpose of exchanging our annual greetings, of renewing our allegiance one to another, of giving evidence that we are competent to do the work required of us, of investigating the current developments in the science and art of our profession, and of increasing our usefulness to ourselves and to our clients in all possible ways.

We shall listen to papers from representative men upon subjects of especial interest, and reports of important committees must be heard and acted upon.

One of the greatest difficulties encountered by your Board of Trustees, now that our field is so much enlarged, is the frequent meagreness of information concerning candidates for membership, and, in order to reduce this difficulty to a minimum, must we not soon devise a better method than the present one of determining whether or not those who wish to join us are qualified by education, by business habits and by personal characteristics to so influence public opinion that we may command the respect and confidence of the several communities in which we work? Whether the present method can be made sufficient by a keener sense of responsibility on the part of those who know the applicants for fellowship or associateship, or whether we should create an office in the nature of a travelling secretaryship, the duties of which would be to come in personal contact with all our members and would-be members, and, by intercourse and correspondence, to make the Institute more surely a common ground where the best instincts and interests of our profession should centre, is a subject which we ought soon carefully to consider.

We must all feel gratified by the growing interest taken in our Institute, which is clearly shown by the unusually large number of applications for membership, and of requests for information as to the organization of additional chapters during the past year, and you will all bear me out when I say that we are especially glad to have admitted so many who are also members of the Western Association of Architects. It is our wish to have the active co-operation of all the best men in the profession, and the being a member of other associations or societies, instead of being a bar against, is, in fact, the very best reason for joining the Institute, as it would then get the benefit of doubly-organized work, and the general welfare would be correspondingly advanced.

Then, again, we wish to see and personally know all those who are doing good work in this great country, and the day will soon come when these annual meetings will be eagerly looked forward to and be largely attended, and when they will be considered not so much from the standpoint of duty as from that of pleasure and privilege; then, also, will the American Institute of Architects accomplish its highest degree of usefulness when it becomes the chief vehicle of professional pleasures as well as of professional duties, and when, to the formal requirements of routine and committee, are generously added the fraternal leaven of impulse and comity.

There were present on the platform, Messrs. A. J. Bloor, secretary, and O. P. Hatfield, treasurer, both of New York.

BOARD OF TRUSTEES.

The secretary read the report of the Board of Trustees. It showed that they had held nine regular and one adjourned meetings at the rooms in New York since the last convention. There had been twelve fellows and fourteen associates elected to membership, and the Board had now before it two applications for original membership and four for promotion. Appropriate mention was made of the death of Detlef Lienau, of New York City. The Board reported on the case where charges had been preferred against a member and they had been requested to ask for his resignation, that the By-Laws had not been complied with, and it had been thought best to reopen the case. New evidence had put such a different phase on the case that all papers had been referred to O. P. Hatfield, who had made an exhaustive report. The methods of securing additional funds were discussed, and it was thought best to recommend that a committee be appointed to make a report on ways and means before the convention adjourned. The formation of new Chapters at Washington and Indianapolis was announced. The activity of the W. A. A. in pushing a bill regulating governmental architecture, and the benefit which had arisen by concerted action with the Institute, were commented on.

The report was referred.

REPORT OF THE TREASURER.

Mr. O. P. Hatfield read his annual report. It showed:

Receipts,	$1396.35
Balance on hand October 1, 1886,	141.04
	1447.39
Disbursements,	1288.26
Now on hand,	159.13
Unpaid dues,	1478.00

He estimated the assets to be about $1,100 over the liabilities. The nucleus of the building fund was $236.75. The report was referred to an Auditing Committee.

COMMITTEE REPORTS.

The report of the Committee on Education consisted of a long article by Prof. N. Clifford Ricker, in charge of the architectural department of the Illinois Industrial University at Champaign. It was a description of the plan employed by him in his instruction.

The Publication Committee reported that 750 copies of the Proceedings of the last convention, as edited by Mr. Bloor, had been printed.

CHAPTER REPORTS.

The Chapters at Baltimore, Boston, Chicago, Cincinnati, Indianapolis, New York, Philadelphia, Rhode Island and Washington, submitted brief reports of work performed during the year. No great gains in membership were reported. New York reported that the Willard trustees had sent their agent to Europe on a collecting trip, and the fruits of it were to be placed in a room in the Metropolitan Museum of Art in New York City. The Secretary for Foreign Correspondence, Mr. W. L. B. Jenney, had nothing to report.

A NOMINATING COMMITTEE,

to nominate officers for the coming year, was appointed as follows: Messrs. E. I. Nickerson, Providence; Henry Lord Gay, Chicago; W. C. Smith, Nashville, Tenn.; Warren R. Briggs, Bridgeport, Conn.; N. C. Ricker, Champaign, Ill.

SPECIAL COMMITTEES.

The Committee on "A bill to provide improved methods in the architectural service of the Federal government in conference with a special committee of the W. A. A.," reported that the bill agreed upon which had been introduced in the last Congress by Hon. Abram Hewitt, had failed to be reported on by the committee to which it had been referred. It recommended, however, that efforts be made to have it introduced again in the next Congress. The report was accepted and referred.

For a report on "Architects' Protective Associations," a letter from Mr. T. M. Clark, of Boston, was accepted. It stated his inability to study into the subject as deeply as would be necessary in order to make a report.

The Committee on a "Permanent Home for the Institute," recommended the formation of a joint stock-company, with a capital of $500,000 in $100-shares, of which the stock should be held by the members of the Institute. This would erect a fire-proof office-building in New York, the top floor of which would be occupied by the rooms of the Institute, and the rest rented for offices to members of the Institute. It was believed that five per cent could be realized on the stock above expenses and reserves.

The Committee on a "Uniform Building Contract," reported that as a result of conferences with committees from the W. A. A. and the National Association of Builders, it had been decided to recommend to their different bodies the adoption of a resolution appointing a committee of three to confer with similar committees during the coming year for the preparation of a uniform building contract. The report was referred.

COMMITTEES APPOINTED.

A committee was appointed to act on the Trustees' report, consisting of Messrs. M. E. Bell, L. T. Schofield and D. Adler. A committee to audit the Treasurer's report was made to consist of D. H. Burnham, Charles Crapsey and J. J. Deery. A committee, to which all other reports should be referred, was appointed, to consist of J. G. Cutler, J. W. McLaughlin and John W. Root.

THE ASSOCIATION OF ALABAMA ARCHITECTS

sent a letter of greeting by its president and secretary, which was accepted and made a part of the minutes.

An invitation to visit a terra-cotta company's works was read.

Announcement was made that the exhibition of architectural drawings, which had been given Wednesday evening on the programme, was not forward enough to bear inspection, and that the Inter-State Exposition would be visited instead.

DISTINCTION IN MEMBERSHIP.

Mr. Adler called up the question of the distinctions between

fellows and associates, and offered a resolution that on and after this date all associates should be made fellows. The resolution was declared out of order, as it sought to amend the By-Laws without thirty days' previous notice having been given. Mr. W. L. B. Jenney moved that the question of equalizing the grades of membership, or of elevating the grade of fellow, be referred to the newly-elected trustees, and it was carried.

Mr. D. Adler, of Chicago, then read a paper on "Theatres," after which adjournment was had for the day.

LUNCH.

By courtesy of the Entertaining Committee, lunch was served informally at the Union League Club, after which drives about the city were tendered the visiting architects.

PERSONS PRESENT.

The following names were inscribed on the register: Edward H. Kendall, New York; O. P. Hatfield, New York; A. J. Bloor, New York; N. Clifford Ricker, Champaign, Ill.; D. H. Burnham, Chicago; Warren R. Briggs, Bridgeport, Conn.; Edward I. Nickerson, Providence; Henry W. Hill, Alfred F. Pashley, and S. S. Beman, Chicago; John J. Deery, Philadelphia; Fred'k H. Gouge, Utica, N. Y.; William S. Wicks, Buffalo; Samuel A. Treat, Normand S. Patton, Chicago; George A. Frederick, Baltimore; Otis Dockstader, Elmira, N. Y.; George W. Rapp, Cincinnati; Jas. G. Cutler, Rochester; Mason Maury, Louisville; C. A. Wallingford, St. Paul; Charles Crapsey, Cincinnati; John W. Root, L. D. Cleaveland, Chicago; C. M. Bartberger, Pittsburg; E. H. Taylor, Cedar Rapids, Ia.; Henry L. Gay, Chicago; Adolph Cluss, Washington; E. L. Walter, Scranton, Pa.; Louis H. Sullivan, Chicago; J. F. Alexander, Lafayette, Ind.; C. A. Curtin, Louisville; John Ord, Philadelphia; M. E. Bell, Chicago; W. Bleddyn Powell, Philadelphia; Wm. C. Smith, Nashville; C. G. Clark, Louisville; W. W. Clay, Chicago; Melvin P. Hapgood, Hartford.

SECOND DAY.

It was an hour and one-quarter after the time set on the programme when Chairman Kendall called the convention to order Thursday morning.

Secretary Bloor read letters from N. Le Brun and George C. Mason, Jr.

BY-LAWS AMENDED.

The following was added to the end of Article I., Section 5, of the By-Laws: —

The name of any honorary member resident in this country, who, after his election to that grade, shall engage in the active practice of the profession, shall not be afterwards printed in the roll of honorary members during the continuance of said active practice.

The following was added at the end of Article V.: —

No president of the Institute shall be eligible for consecutive reëlection to the annual term more than once, and presidents above the age of seventy, who have served for two years, shall, if they so elect, be exempt from the payment of annual dues, and be enrolled as honorary members, with the addition of the title of past president; and, in any case, shall continue to have all the privileges of the Institute, including that of voting.

A report of nominating committee was made, but as it contained the names of several associates, who, under the constitution, were not eligible for office, it was referred to committee on nomination for correction.

RESOLUTIONS.

Mr. James G. Cutler moved that a committee of three be appointed to draft resolutions concerning the indebtedness of the Institute to Thomas U. Walter, LL.D.

REPORTS OF COMMITTEES.

The special committee appointed to consider the report of the Board of Trustees reported, suggesting thanks to the Board for their labors, and that their report be placed on the minutes, and that its recommendations be taken up one by one, and considered by the convention. It recommended that the papers in the case of unprofessional conduct be placed at the use of the members. The report was accepted.

The committee appointed to audit the accounts of Treasurer Hatfield reported them correct. The report was accepted.

The special committee on consideration of other reports made a report which contained the following recommendations: —

1. That the chairman's address and the report of the committee on education be referred to the committee on publication.

2. That a form be devised, on which secretaries of chapters could make annual reports covering such information as was really important to have from each chapter.

3. That the reports which had been received from the various chapters be accepted, and the cause of the absence of reports from the chapters at St. Louis and San Francisco be ascertained.

4. That the committee on a Permanent Home for the Institute be continued and enlarged to five members.

5. That the report of the committee on a uniform building contract be adopted and its advice followed.

6. That the committee on "Architects' Protective Associations" be discharged, and that protection should be furnished from within the Institute rather than by legislation.

7. That the committee on the government architectural bill be continued, and Mr. M. E. Bell and another member be added to it.

8. That the report of the publication committee be accepted.

The report of the special committee was accepted.

Papers were then read. Mr. Bell, of Chicago, formerly Supervising Architect of the Treasury, read one on the "National Building Question." It was a summary of what the paramount requirements were for a building for government purposes should be. As a condensed statement of his four years' experience in the office, it was very interesting.

Mr. Charles Ham, of Chicago, assistant treasurer of Cook county, read a paper on "Manual Training as applied to the Building Arts."

Mr. W. W. Boyington, of Chicago, read a paper entitled, "Differences between the Methods of Architectural Practice prevalent now and fifty years ago."

REPORT OF COMMITTEE ON NOMINATIONS.

The committee on nominations here made a second report, which recommended these gentlemen for officers for 1887–88: —

President, Richard M. Hunt, of New York City.

Secretary, William A. Pattee, of New York City.

Treasurer, O. P. Hatfield, of New York City.

Board of Trustees: Napoleon Le Brun, of New York City; L. T. Schofield, of Cleveland, O.; Henry M. Congdon, of New York City; John W. Root, of Chicago.

Committee on Education: Messrs. N. C. Ricker, Champaign, Ill.; Alfred Stone, Providence, R. I.; Wm. R. Ware, New York City; J. W. McLaughlin, Cincinnati, O.; Henry Van Brunt, Boston.

Committee on Publication: Charles Crapsey, Cincinnati, O.; T. M. Clark, Boston, Mass.; S. S. Beman, Chicago, Ill.; George C. Mason, Jr., Newport, R. I.

Secretary for Foreign Correspondence, Arthur Rotch, of Boston.

These officers were elected.

An amendment to the By-Laws, by the adoption of which Associates will become eligible for office, was offered by Mr. Briggs, of Bridgeport, Conn., for action next year.

The Institute was invited to visit the Chicago Manual Training School.

The committee on nominations made a supplementary report, in which the proposed action for expressing to Mr. A. J. Bloor the indebtedness which the Institute owes him for continued services was gracefully sustained, and the report was accepted.

LUNCH.

The Institute then adjourned to lunch served by the kindness of the entertaining committees, at Kinsley's, after which carriages were taken, and the north division of the city visited by those who desired so to do.

The exhibit of recent architectural work, from which so much was expected, turned out to be rather small. Only the contributions from Chicago saved it from being a failure as an exhibit. Nineteen architects and firms from Chicago were represented. Nine outside architects sent contributions, the most prominent of which was the design for the custom-house at Detroit. The character of the work exhibited, as to style and rendition, was superior, and in those respects the exhibit was superior to any yet held in Chicago.

The exhibit of comparative drawing loaned by the *American Architect and Building News*, was a very interesting feature. Three other architectural journals loaned photographs, etc.

EVENING SESSION.

After thoroughly examining the exhibit, Chairman Kendall called the convention to order in the Assembly-room, and a paper was read by Mr. John Moser, of the Supervising Architect's office, on "Federal Buildings for Judiciary, Customs, and Postal Service." He described the process to be followed in developing the plans for a large government building, touched on the style which government buildings should possess, bringing out his somewhat well-known ideas as to the "melting together the quiet serenity of the Greek" and other styles, and followed his reading by suggestive black-board sketches.

THIRD DAY.

The chairman, in calling the convention to order, asked for the reading of a paper by Mr. D. H. Burnham, of Chicago, on "Suggestions towards the Best and Speediest Methods for Harmonizing and Utilizing all the Architectural Societies in the United States," etc.

After the reading of the paper, Mr. Burnham offered the following resolution, which was seconded by Mr. A. J. Bloor, and was unanimously passed: —

Resolved, That a committee of five members be appointed, of which the Chairman of this Convention shall be a member, *ex-officio*, the other members to be selected by him, to act jointly with one of similar number to be appointed by the Western Association of Architects at their next general meeting, and to report as to the best and speediest method of consolidating all the architectural societies of America into one organization; their report to be full regarding form and constitution for local societies, and also regarding form, constitution, permanent place of meeting, and proper quarters for the national or representative body.

That the Western Association of Architects be, and they are hereby cordially invited to unite with us in this work, and to appoint a committee as above.

The next paper was on "The Essential Features of a Large Opera House," by Mr. J. C. Cady, of New York City.

This was followed by a paper on "The Paramount Requirements of a large Library Building," by Mr. J. L. Smithmeyer, of Washington, D. C. In introducing the paper he stated these requirements to be: "Abundance of solar light, a generous provision of artificial light at night, plenty of pure air of a suitable temperature, well-designed protection against the ravages of fire and against the deleterious influences of dampness, proper ventilation, convenient interior arrangement, durability of building materials, and stability of construction." To these he added other important considerations of a suitable site, high and dry, plenty of distance between it and other buildings, ample provision for ingress and egress, ample opportunity to expand the book-holding capacity so as to postpone the enlargement of the building as long as possible, good sanitary arrangements and easy approaches. As to the evolving of a design and style, he said it should "wear the livery of good taste, and exhibit, even to unskilled eyes, its purpose." Different plans of book and room arrangement were fully described.

Mr. Geo. A. Frederick, of Baltimore, then read a paper on "Dining-rooms," treating of their adornment and decoration.

The next paper was on "The Line of Demarcation between Engineering and Architectural Practice," and was written by Mr. Joseph M. Wilson, of Philadelphia. He divided engineering into two classes, civil and military, with the latter of which we have nothing to do. He then divided civil engineering into specialties as transport engineering, hydraulic, sanitary, coast-works, mining, mechanical, electrical, bridge, and architectural. The pure architect begins where the engineer ends. All engineers cannot be architects, but all practising architects must be engineers, more or less. If he feels inability in this direction, he should associate with one who can supply the deficiency, and reserve to himself the artistic part of the profession. No strict line can be drawn between engineering and architecture. "The one is the prose, the other the poetry of the art of building."

COMMITTEES.

Chairman Kendall announced these committees: —

To prepare resolutions concerning ex-President Walter: J. W. McLaughlin, W. C. Smith, J. G. Cutler.

To make a blank form for Reports of Chapters: N. C. Ricker, W. G. Preston, and G. A. Frederick.

On a Uniform Building Contract: O. P. Hatfield, J. H. Windrim, Alfred Stone.

To indemnify Mr. Bloor for his eminent services: H. H. Holly, H. L. Gay, John Murdoch, Henry Van Brunt, Jas. B. Lizius, T. P. Chandler, Alfred Stone, Augustus Laver, H. G. Isaacs, and J. L. Smithmeyer.

The convention then acted on the recommendation of the Board of Trustees, that a committee be appointed to devise ways of raising more money, and referred it to the committee to be appointed in accordance with the resolution of Mr. Burnham.

The convention adopted the recommendation of the special committee that the reports of secretaries of chapters be made one month before the Institute's convention.

The convention decided to continue the committee on Federal architecture, as recommended by the special committee, adding Mr. Bell, and one member west of New York City to it.

A recess of thirty minutes was then taken for lunch, which was served in the rooms.

The committee from the Western Association on the metric system sent in a communication asking the Institute to resurrect its former interest in the subject. The communication was referred to the Board of Trustees, with power.

A letter was read by the secretary from Supervising Architect W. A. Freret, explaining his inability to attend the meeting and his regrets.

The Institute then went into executive session on the "unprofessional conduct" case.

Upon reopening the doors, various resolutions of thanks were passed, and the Institute adjourned.

At the close of the sessions the register showed the following additional names. It was, even then, not nearly complete: —

S. V. Shipman, Wm. Holabird, J. L. Silsbee, W. L. B. Jenney, W. A. Otis, D. Adler, John Addison, Aug. Fiedler, Alfred Smith, James R. Willett, all of Chicago; R. W. Gibson, Albany, N. Y.; S. R. Burns, Dayton, O.; John Moser, Washington; L. T. Schofield, Cleveland, O.; Jas. W. McLaughlin, Cincinnati, O.; W. R. Brown, Cincinnati, O.

CONCRETE FORTS. — We see that experiments are to be made shortly at Lydd as to the capabilities of a concrete turret to resist the impact of modern projectiles. A concrete tower is to be erected and covered with thirty feet of earth. We described a short time ago what a scientific French general had recommended as the fort of the future. This was an oval fort of concrete, shaped like a dish cover, without a ditch or flanking works of any kind, and having a thickly plated iron cupola in the center, armed with two or three heavy guns, and with disappearing turrets for quick-firing guns. These masses of concrete are pretty nearly solid, covering subterranean barracks and store-rooms, and they would require very small garrisons. We believe the Belgian defenses on the Meuse will partake something of this character. The heavy guns are placed in pairs parallel to one another in the turrets, and are turned away from the enemy when loading takes place. — *Broad Arrow.*

ARCHITECTURE AT THE PRESENT TIME AS COMPARED WITH THAT OF FIFTY YEARS AGO.[1]

A ROMAN FRAGMENT.
— the Museum at Dijon.

FIFTY years ago is an earlier period than my experience as an architect extends; it was, however, in the early years of my studies in architecture. In order to demonstrate fully the progress of architecture during the last half century, would it not be well to compare its progress with some of the other arts and sciences; for instance, steam and electricity, as they are closely allied to architecture in the complete construction of buildings? Steam was better understood fifty years ago in this country than architecture or electricity. Architecture was then understood and practiced as a separate profession by very few persons. I think it is safe to say that there are more architects in practice to-day in the city of Chicago than there were then in the whole United States. I think it is also safe to say that with the exception of the science of electricity, architecture has made greater strides than any other of the arts and sciences. I claim that architecture combines both art and science to a greater degree than any other profession. To-day, we can vie with any country in the world in style and permanency of construction. Fifty years ago this country knew no style in architecture except the Classic and the Gothic, and but very few pure examples of either of those styles were executed in this country. The majority of buildings at that period were planned and built by master builders, who usually made their plans on the face of the trestle-board, and shaded them with white, red and blue chalk to designate wood, brick and stone. Details were made, full size, in the same way. My father was a master builder, and used to make his own plans largely in the way mentioned. Architectural works in that early period were but few. Foreign works at that day were very expensive. I recollect the works of Benjamin Hill, La Fevre, and a few other authors, not to exceed half-a-dozen, altogether. At the present time we have a very large number of architectural publications and upwards of three thousand practising architects. I trust a majority of them are doing a legitimate commission business, and are not mere tools of contractors. Fifty years ago, and even less, architects were largely supported by contractors. Now, and for years past, the owners have found it for their interest to deal directly with architects. Still there are many impecunious persons who think that it is money wasted to employ an architect so long as they can get the services of one through their contractor, when, by so doing, they do, as a usual thing, indirectly pay three prices for their plans. I think I am correct in saying that Philadelphia is the largest city in this country which can boast that it has more buildings built in the last fifty years in proportion to its inhabitants, without the employment of architects. They used to build miles of street fronts with builders to duplicate a certain mould with but slight variations to suit localities or notions of proprietors. That system, I am glad to say, is largely done away with even in Philadelphia, and architects' services are more fully appreciated. Still in Philadelphia there are, to-day, a less number of architects, per capita, than in any other large city. When I came to Chicago, thirty-four years ago, I found the architects then in practice were recent master builders or contractors. Chicago and the West at that time could hardly be said to require the services of architects, separately as such. At that time the structures were but simple buildings, but the builders soon found that it would be better for them to have plans made rather than to spend their time in making plans, so they clubbed together, and induced one of them most apt in drawing plans to give up his contracting and to devote his whole time to architecture, and guaranteed him a compensation of $2 per day, which should be paid to him if he did not get business enough to aggregate that amount. I have been told by a person who was acquainted with the early workings of the first architect of this city, that he had an order for a set of plans for a dwelling, which he made and charged $5 for them, and was much elated over the circumstance. From this small beginning others started, and on my arrival I was introduced by friends, or had letters of introduction to citizens, as a young architect from Massachusetts. This simply shows that as a profession it was not understood. It is not so now. No profession is better or more favorably known. Having mentioned the small compensation which architects were obtaining for plans, and that it came largely from contractors, I might state that when I commenced business in Chicago I immediately instituted the custom of charging a percentage on the cost of buildings as the only proper course to pursue, and always collected it from the owners. This departure was rather up-hill work, but I have plenty of witnesses now to show that it was a success. And from that small beginning we can, to-day, boast of as fine and as capable a corps of architects as any city of the Union, and the architect who first commenced practice in this city is still living. Chicago has been a sort of radiating point. My sphere of practice has extended from the Gulf of Mexico on the south, to Manitoba on the north, and from the Atlantic to the Pacific, together with the intermediate cities on the

[1] A paper read by W. W. Boyington at the Twenty-first Annual Convention of the American Institute of Architects.

lines from East to West and from North to South. How is it with other arts, sciences and professions? Have they kept equal pace? Railroads were but little known fifty years ago; the same with electricity. Steam-power was well developed, but the mechanism was very crude as compared with the present. Electricity can hardly be said to have developed into any practical use half a century ago. Consequently, I think we must give way to the scientific development of electricity. I well remember some few simple electrical experiments made by stringing wires around a town-hall, and, with a crude instrument and battery, a circuit was made around the hall and a few interesting experimental freaks were produced. From this small beginning the world has been brought together within speaking communication, and a power produced, yet in its infancy, which is destined to be improved to the wonder and astonishment of the world. Hence we must assign to it the place of the leading science of the past fifty years. While we accord this, we must not forget the very crude construction of railroads. First, the wood-stringer with iron strap rails, more familiarly known as the "snake-head" rail. On these rails the engines were constructed to run without tenders or covers of any kind to protect the engineer or firemen. They used to stand on the open platform exposed to the severity of the weather and storms. It was in the year 1840, I think, that I was called upon by the Master Mechanic and General Superintendent of the Boston & Albany Railroad to see if I could not devise some kind of protection at least partially to cover the engineer and firemen, and have it sufficiently open not to obstruct their view. I examined an engine and reported that I could construct a cover. I was at once employed to make the necessary drawings and superintend the construction of the first cab over an engine in this or in any other country. The result was a perfect success, upon which there has not been any material improvement, as it was almost identical with the cab now in use. I need hardly inform you that its use was immediately adopted throughout this country. Had I had forethought enough to have secured a patent for the device, I probably would not have been called upon to prepare this paper. I trust you will forgive me for diverging so far from the subject given me. The mention of these somewhat kindred subjects has been prompted by the incidents in my early life that were fastened so strongly in my mind in connection with my studies and practice in architecture.

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

BALMORAL CASTLE, SCOTLAND.

[Gelatine Print, issued only with the Imperial and Gelatine Editions.]

COMPETITIVE DESIGN FOR THE SYNDICATE BLOCK ON STATE STREET, BOSTON, MASS. MESSRS. BRADLEE, WINSLOW & WETHERELL, ARCHITECTS, BOSTON, MASS.

GREENWICH HOSPITAL, LONDON. AFTER AN ETCHING BY DR. SEYMOUR HADEN.

For the privilege of reproducing this subject we are indebted to Messrs. F. Keppel & Co., of New York.

New Regulations for Paris Theatres. — The new Paris police ordinance concerning theatres requires that the building must have space or alleyways on the sides and back, or, if back to back with another building, a thick rear wall. The three parts of the theatre, auditorium, stage, and dressing-rooms and offices, must be separated by masonry walls. Ceilings and dome must be of iron and masonry. Doors from auditorium to stage must be of iron, and so must the rolling curtain, made in meshes. The curtain must be held up by non-combustible cords. Scenery must be uninflammable and tested twice a year. Workrooms must be separate from the stage and auditorium. Stairs must be of iron and masonry, and of a certain prescribed width and number. There must be a lobby around each story of the auditorium. Theatres must be heated only by registers, with furnaces in the basement and pipes of earthenware. Gas may be used for lighting, but always with a tell-tale in each part of the house. Gasoline, mineral oils and hydrocarbons may not be used, but oil-lamps with glass shades, and kept lighted during each performance, must be sufficiently numerous to prevent total darkness if electricity or gas give out. There must be ample reservoirs of water and a hydrant with pressure to throw streams to the highest parts of each house. There must be fire-escapes on exterior walls, and means for telegraphing to nearest fire-engine house. Each theatre must have offices for police, physicians, service-guard and firemen. There must not be a smoking-room or any stores, unless the latter are permitted by the police. A commissary of police with a squad proportioned to the size of the house, a squad of firemen and a corps of physicians must attend each performance. The ordinance is so minute and complete that not a third of the requirements are included in the above digest, which gives only the more important prescriptions. — *Exchange.*

THEATRES.[1]

Mantel in the Ducal Palace Venezia.

After Drawing by R. Burdett in The Architect

As we are all American practitioners whose work is confined within the geographical limits of the United States, and therefore within the financial and other limitations arising from our national peculiarities, I will make no effort to describe the ideal large opera house, of which so many examples exist in Europe, but will confine myself to the essentials and peculiarities of an American theatre and opera house containing upward of 3,000 seats, and capable of serving also as a concert or convention hall.

The site of our building should be an open square surrounded by broad streets; but in no case should a site be chosen which does not permit the disengagement of the building on at least three sides.

The construction of such a building should be of the most solid and enduring materials, so disposed as to produce a building as nearly fireproof as modern science and art can make it. The ever-changing conditions of desirability of location so characteristic of American cities must be disregarded by making permanence and stability of structure paramount considerations.

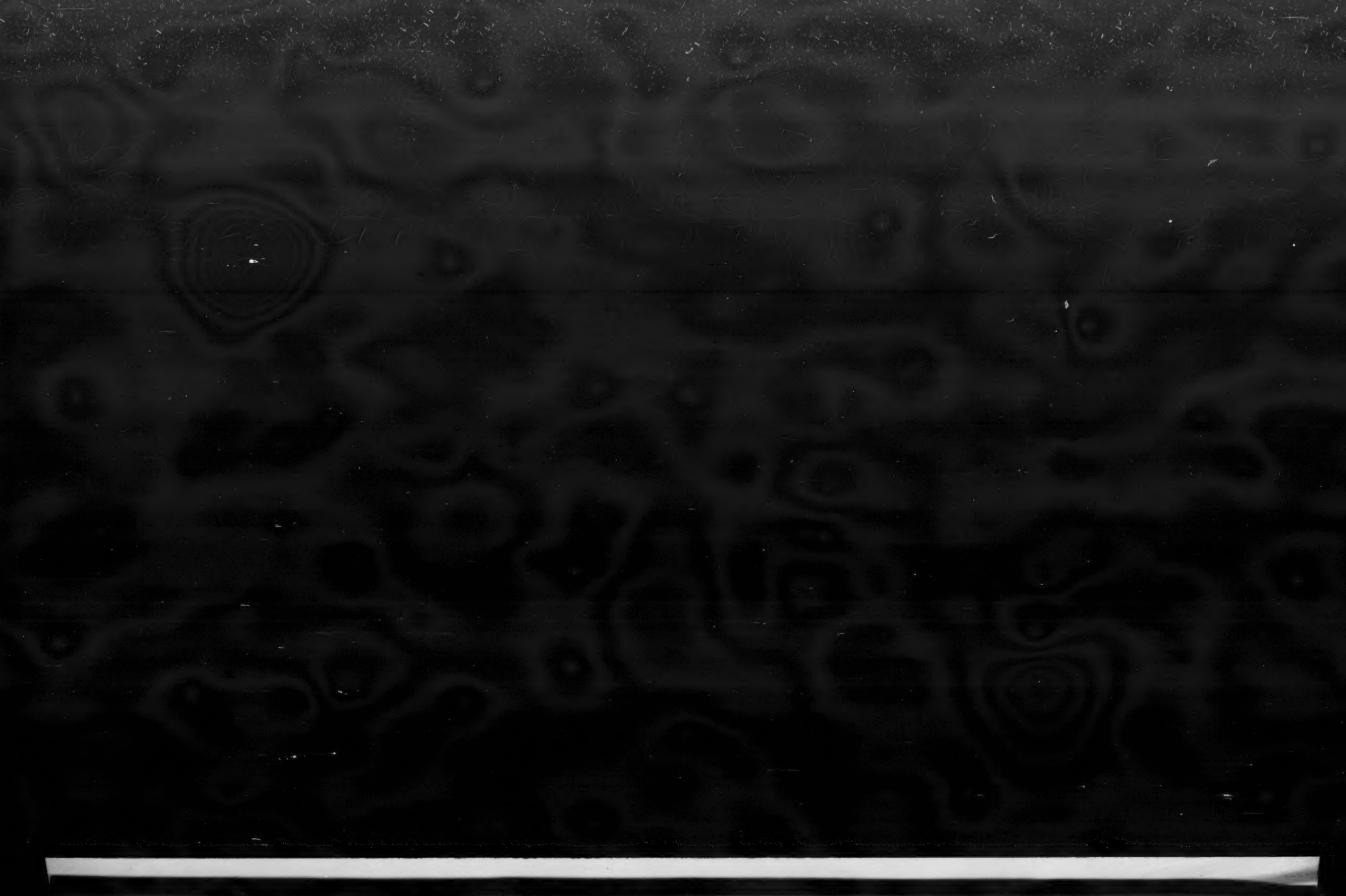
In the disposition of space we are confronted by limitations which prevent the fulfilment of ideal requirements. Municipal aid is with us never extended to the building of an opera house, which must, therefore, be erected by private capital, of which it seems impossible to secure as much as is required for erection and maintenance without connection therewith some means of commercial utilization, so that a revenue sufficient for the maintenance of stage and auditorium during the many periods of disuse may be obtained.

This disposition of important parts of the ground, generally the street frontage, increases the difficulty of planning the lobbies, foyers and corridors, so desirable for a structure of this kind; but whatever the wants or necessities of the commercial adjuncts of such building, there should always be lobby space enough to hold almost the entire audience.

In determining the space to be assigned to the stage, it must be remembered that without suitable provision for presenting to the public scenic and dramatic effects on a far grander scale than can be produced in the ordinary theatre or opera house, there would be no justification for the existence of a building of the class which I am endeavoring to describe. And yet, too much space should not be assigned to the stage, as the commercial result of the enterprise must be kept in mind, and this requires a reasonable proportion between the cost of producing a good opera or spectacular theatrical performance and the size of the audience which can be drawn to see the same. We have no subsidy from municipal or general government to make good deficiencies which would arise from the cost of performances given upon a stage of the proportions found in the opera houses of the old world. Besides, we cannot in any city of our country maintain, still less carry with a travelling company, a permanent, well-trained chorus corps de ballet, or a corps of trained supernumeraries sufficiently large to fill a stage approximating in size that of a European house of the first rank.

A very large space should be assigned to the mechanisms for the production of scenic transformations and illusions. Nothing is more annoying to American audiences than the excessively long waits between acts so characteristic of operatic performances on a large scale as we know them on the American stage. And while the almost magic transformations characteristic of the stage of the Madison Square theatre are impossible of attainment under ordinary conditions, I believe that a happy mean can be found between these and the evil before referred to. One of the means of securing this end would be an effort to keep all moving and movable parts incidental to the production of scenic effects, transformations, etc., within reasonable bounds as to size and weight; and, as far as possible, to make transformations by upward and downward movement of the stage paraphernalia, by which means the horizontal dimension of the stage can be minimized, although great depth below and height above the

[1] A paper read by D. Adler, F.A.I.A., at the Twenty-first Annual Convention of the American Institute of Architects.



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PROPOSED

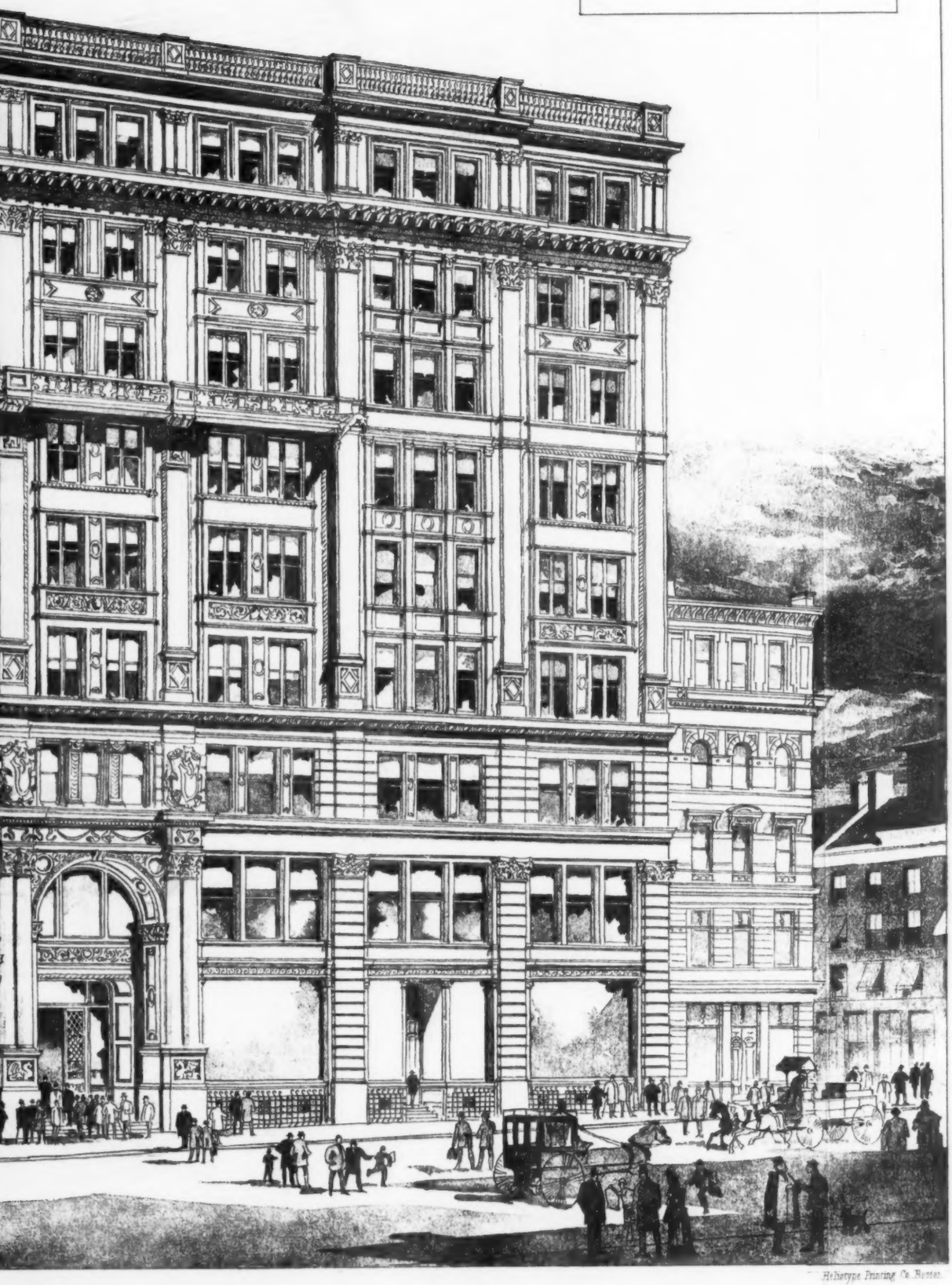
NEW EXCHANGE BUILDING,

FOR THE

STATE STREET SYNDICATE

BOSTON.

BRADLEE, WINSLOW & WETHERELL, ARCHITECTS, BOSTON, MASS.



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Elevation · on · State · Street ·

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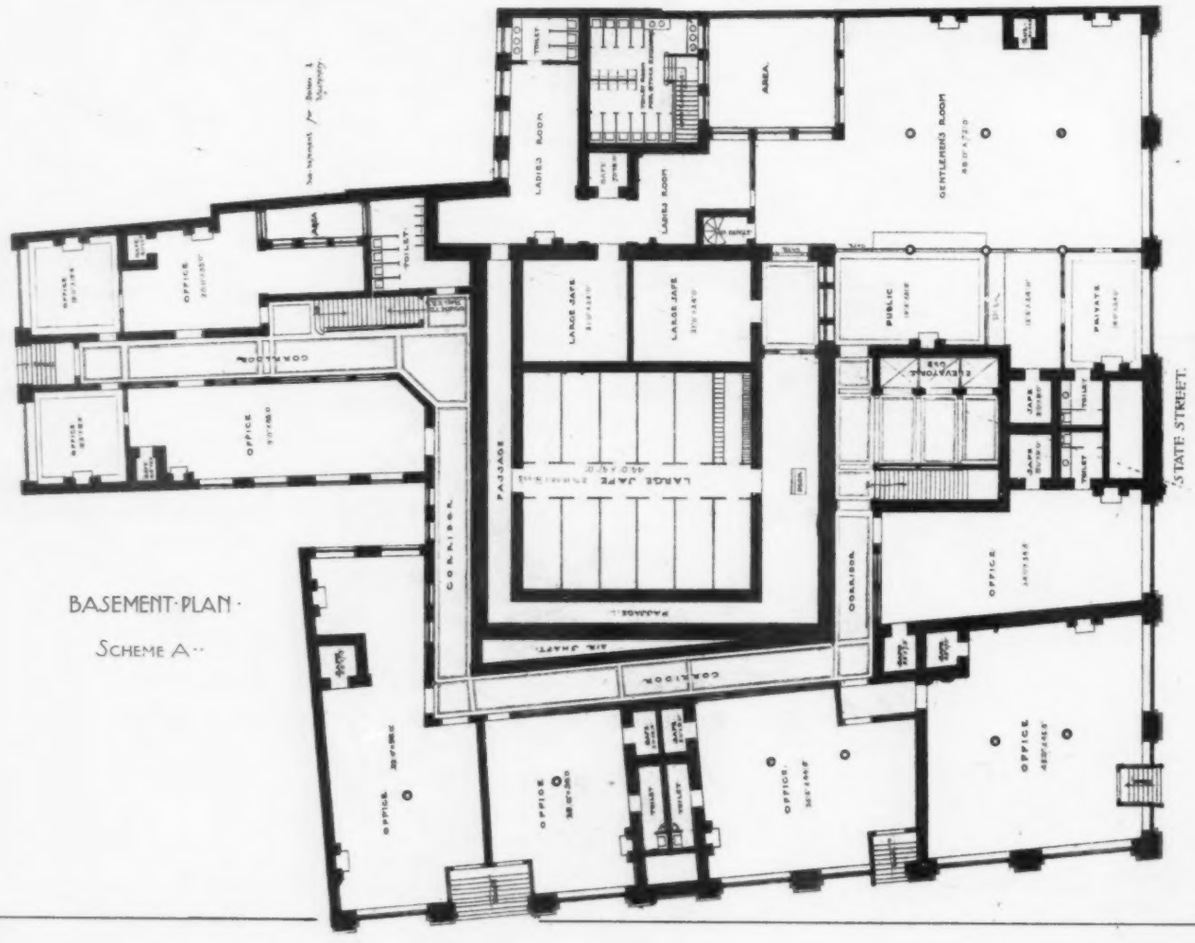

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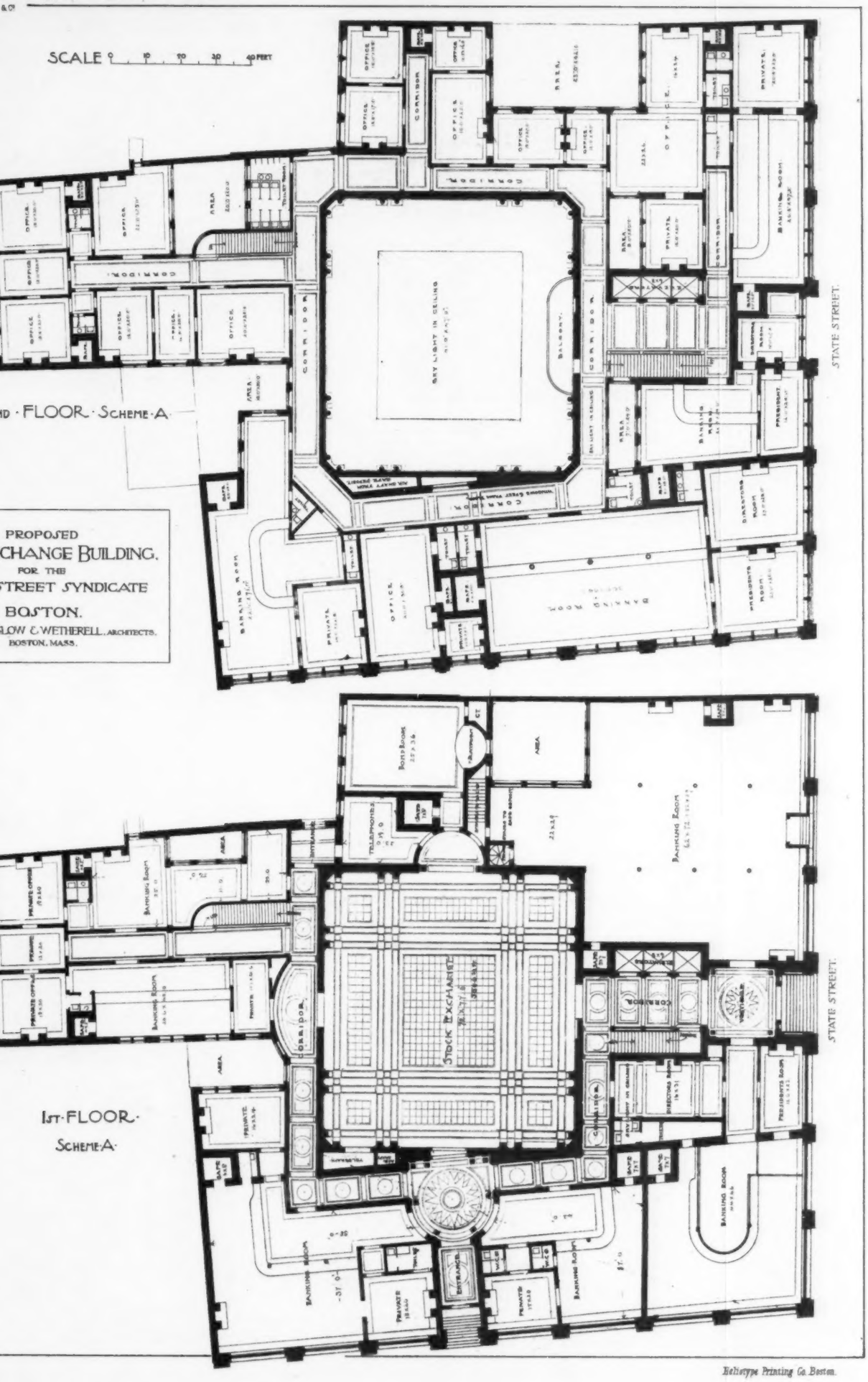

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Greenwich Hospita

Heliotype Printing Co. Boston.

arpital

stage floor would become essential. Liberal allowance of space for dressing-rooms, and for storage of scenes, properties and costumes must not be forgotten.

It is advisable to endeavor to secure at least partial sunlight illumination of the house, and thus avoid the expense of artificial illumination for daily cleaning, rehearsals, and for day-light assemblies, such as conventions, mass-meetings, concerts, etc., when scenic effects are not to be produced. This daylight illumination will almost invariably be imperfect, for corridors, lobbies, etc., and in many instances the business adjuncts of the building will cut off all means of illumination except skylights, and these can rarely be made sufficient to light up all parts of the house. Means must be provided to shut off, when necessary, all sunlight which might interfere with the realization of scenic effects.

Day and night illumination of the stage, when occupied for a scenic representation of any kind, must be by artificial light. Of the artificial lights known to us, the incandescent electric light is the only one to be seriously considered, in the design and distribution of which every effort should be made to secure a uniform and general illumination — a lighting up of all shadows under galleries, and an illumination which will reveal clearly all faces and toilets without bringing them into a trying glare. In arranging the lights of the stage it is necessary to see to it that the light falls upon the faces of the performers in such manner that there will be no shadows which produce distortions of their features. It is well, also, in arranging lights, particularly those on and immediately in front of the stage, to interpose reflecting surfaces which throw the light where it is required, and shut out its glare from the direct line of vision of the audience.

In the construction and laying out of the engines, dynamos and wiring for the electric light, an effort should be made by suitable sub-divisions to prevent the possible putting out of all the lights by any accident to the machinery or wires. The practice of European theatres in providing as a safeguard for such contingency a system of oil lamps or wax candles arranged and always kept burning around the walls of the auditorium and in all the corridors, is worthy of imitation.

The means of ingress or egress should, of course, be ample. No allowance of less than three feet for each two hundred persons in determining the width of aisles, doors and stairways, should be considered. A large number of narrow aisles is to be preferred to a small number of wide ones. Aisles should lead as directly as possible to doors. As before stated, the corridors and lobbies should be of sufficient size to hold more than one-half the audience. The stairways must have frequent landings, and the exits should be so disposed as to tend to disperse the audience as rapidly as possible.

Where audiences are very large the means of ingress become quite important, and every facility must be extended to those who purchase their tickets at the beginning of a performance, and these should be kept out of the way of persons who come already provided with tickets, and every means must be used to facilitate the entrance of the public into the building, and to prevent blocking up the halls, corridors, or stairs.

Heating and ventilation present unusual difficulties in a house of this kind. No dependence whatever can be placed upon doors and windows. The air must be warmed in winter and cooled in summer. A sufficient volume of air for comfort and health must be forced into and removed from the room by mechanical means. The temperature and hygrometric condition of the air admitted must be under perfect control, and the means for exhausting the air must be so arranged that the vitiated air in its progress to the exhaust ducts does not come in contact with the heads of any part of the audience, and that "draughts" are prevented. It is desirable, for acoustic effect, to have all air currents tending from the stage outward. It will be easiest to attain these ends if the fresh air is chiefly introduced at and from the top, and in greatest volume near the stage, and if the exhausts are in and near the main floor and in and near the floor of the various galleries and balconies, increasing in capacity with their distance from the stage. One-third of the air-ducts should open on the stage, but these ducts must be under the immediate control of the prompter, so that they may be closed when smoke is produced on the stage, and while the curtain is lowered, and turned again as the curtain is raised.

Wherever possible the galleries should be disengaged from the walls behind them so as to permit the free passage of air currents through the space covered by the gallery.

As a protection against drafts from outdoors there should be, if possible, at least four sets of doors between the chief lobbies and the outer air, and each of the spaces enclosed by these doors should be warmed.

The means of cooling the air for summer ventilation must be by refrigerator machines. It is impossible to handle successfully a sufficient quantity of ice for our purpose. In dusty and smoky cities an apparatus for washing the air before it is introduced into the building should be provided.

As it would be too expensive to call into use the means of heating provided by the ventilating system for the daily cleaning of the house and for rehearsals, there should be a sufficient quantity of direct radiating pipes and coils on the stage and in the auditorium to warm the house to a moderate extent. These would be used when the house is occupied except, perhaps, in the coldest weather.

Foremost among the necessary hygienic arrangements is the system of ventilation before described. Next in order are the plumbing fixtures and pipes, upon which even greater care must be expended than in ordinary buildings. During the periods of disuse to which houses of this kind are subject, the evaporation of water from traps, or the syphonage of traps, or leaks of soil or waste-pipe, would produce most disastrous results. These contingencies must, therefore, be guarded against with the utmost care. During these same periods of disuse in winter the danger by freezing of water in the pipes is a danger against which precaution must be taken.

The provisions against conflagration are a most fruitful topic. As it has been assumed that the general construction of our house must be fireproof, we have in this already a most potent safeguard against conflagration. If we carry this fireproof construction further, and use for the frame-work of the stage, stage mechanisms and paraphernalia, incombustible materials, and banish gas from the stage entirely, using only electric light not only for the white light but also for the effects of colored light, we shall have eliminated entirely the danger of disastrous conflagration from our house. It will, however, be impossible to avoid entirely the use of canvas for scenery and the use of wood for the lighter and more temporary accessories of stage setting, and the large quantities of costumes and properties which accumulate about such a house are necessarily combustible. While a fire among these cannot be considered a menace to the structure, still there should be means at hand for readily extinguishing it. There is a choice, such as a system of automatic sprinklers, or the thorough training of the stage attendants in the use of water in tanks and pails, in the use of hand-pumps, hand-grenades, chemical fire-extinguishers, etc. But although the building is indestructible by fire, and although the gathering of headway by a fire is almost absolutely guarded against, alarms and frights may arise which, in so large an audience, would have serious consequences. A strong drop-curtain of indestructible material, used daily so as to be always in readiness for instant use in an emergency, will shut off from the view of the audience the accidental burning on the stage of small pieces of scenery, etc., as may have been left unprotected. A very large and high smoke-duct above the stage, the valve of which is connected with the prompter's stand, will permit the immediate and rapid escape of smoke produced by such fire, or by the use of fire-arms, etc., on the stage.

It is safe to assume that an audience in a house of this description is absolutely safe from fire; that is, that no combination of circumstances can arise by which any member of the audience can be injured in life and limb directly by the effects of the fire. There always exists, however, an element of danger in the liability in large assemblies to become panic-stricken and uncontrollable. The general solidity of construction and general safeguards against fire, mentioned before, will do much toward preventing the formation of a panic in the audience. Arrangements for averting the danger of the going out of all the lights in the house will eliminate another serious possibility of panic and danger.

The foregoing provides sufficiently for the safety, comfort and health of the audience; but all of these will be as naught unless the acoustic properties are such as to permit the easy and distinct transmission of articulated sound to its remotest parts. The suggestions given under the head of ventilation will be one of the means necessary for securing this end.

In addition to this, it should be said, in a general way, that in the construction of the banks of the seats, Scott Russell's isacoustic curve should be adhered to as far as practicable. That wherever possible resonant materials should be used in the construction and facing; that large, hard, smooth surfaces should be avoided; that walls and ceilings should be well broken; that the width and height of the house should be least at the stage, and that these dimensions should be increased with the distance from the stage, and that all our measures should tend toward the reduction to a minimum of the volume of air to be set in motion by the voices of speakers and singers, also to such arrangement of surfaces as will tend to direct the sound waves toward the audience, and such control of the air-currents as will prevent the dissipation of sound waves in space.

I will add in this connection that a comparatively low proscenium, and not exclusively wide-opening, is desirable as one of the first conditions of this system of construction for acoustic effect. If it is intended to use the house for conventions or concerts by mammoth choruses, the proscenium may be so constructed as to leave its width adjustable at pleasure, and a temporary ceiling may be suspended at or near the level of the crown of the proscenium-arch over the stage, and hung with a downward slant toward the back of the stage.

As I have said before, a modification of Scott Russell's isacoustic curve should be used in laying out the banking of the seats. This modification is for the purpose of obtaining an isaoptic line, and consists in shifting the level of the focus to which the curves are drawn from the level of a speaker's mouth to the floor-line at the front of the stage, and in substituting for a single focus to the middle of the stage, foci tending toward the sides of the curtain opening for the respective sides of the house so that the focus of the curve for the seats nearest any one side is at a corresponding jamb of the curtain opening.

It may not be always to follow the foregoing absolutely in the selection of foci for isacoustic and isaoptic lines, but the deviation should never be great, and the nearer the approach to these conditions the easier will be the sight-lines for all occupants of the house.

It will be found as one of the effects of an adherence to the foregoing that long, wide side galleries must be banished.

As Mr. Bloor has well said in his letter requesting this paper, "style is generally conceded to be a matter of taste, chiefly dependent upon education or temperament, environment or fashion, or on a combination of these; I have not included it under paramount requirements, but it is, nevertheless, the crowning element of an edifice in its relations with the contemporary public, and with posterity and history." And I will say upon this head only this, that the general proportions and materials of construction of such a building as this justify a general simplicity and demand the utmost dignity of treatment. This simplicity should, however, not become baldness, nor should the poetic element be excluded from the design.

THE ESSENTIAL FEATURES OF A LARGE OPERA HOUSE.[1]

WE shall best understand the essential features of a large Opera House if we first consider, though very briefly, the purposes of the building.

These are threefold — musical, dramatic, and social. The first two are realized in the production of what is termed "Grand Opera;" works planned upon an extensive scale, requiring large forces both musical and dramatic, and extensive and elaborate scenery and machinery for the impressive effects desired. It will readily be seen that "Grand Opera" must be a very expensive affair; the number of artists and employés in great performances sometimes reaching several hundred. The arrangement for their proper display and action must be very extensive, and the scenery and machinery both in variety and magnitude far exceed what is required for other dramatic entertainments.

Preparations of such magnitude and cost for the performances very naturally demand that preparations shall also be made for a large audience to meet the expense incurred, and thus it comes about that a building for a worthy production of Grand Opera must be an immense one, — the forces required to produce it with any degree of splendor and effect are so great that the audience necessary to support these forces must be very large, and in consequence the building of unusual size and costliness.

But so costly are these performances that even the largest audiences will not meet the expense incurred, and other sources of revenue have always been indispensable.

On the Continent, Government aid has been freely given — both in building and supporting immense and famous Opera Houses. In this country, where the Government is not "paternal," aid has been found in another quarter: the wealthy, fashionable classes, who, even if not caring especially for, nor appreciating deeply the music, find it a peculiar and valuable social feature.

Its boxes afford a rare opportunity for the display of beauty and toilets.

They also give opportunity for the informal exchange of social courtesies, being open to select callers through the evening; the long waits between the acts especially favoring such interchange.

If at any time the box is not needed, the tender of it to friends is a very handsome compliment, and one that can sometimes be rendered where no other would be suitable.

For these and similar reasons the opera appeals strongly to the wealthy fashionables, who are able to give it the financial support that is indispensable, and so we find the third purpose of the Opera House — *the social one.*

The last feature is so important in a financial way that it naturally is the foundation of any enterprise of this kind, and in no small a degree determines the size and character of the house — the promoters of the enterprise will first decide how many persons can be secured to engage boxes at a cost of some $15,000 each, with assessments perhaps of $1,500 per annum. From fifty to seventy such must be found to raise a fund sufficiently large for a building; not a monumental building — but a capacious, tasteful and fireproof structure, suitable for Grand Opera.

The fifty, sixty or seventy box-holders must all be eligibly located — in not more than two tiers — which goes far to establish the size of the auditorium.

From the foregoing it will be seen that provision must be made in an Opera House for

1. A stage and its accessories on a grand scale.
2. For safely and comfortably seating a large general audience, and
3. For accommodating liberally and elegantly the box-holders who have built the house, guarantee it against loss, and receive their special accommodations as a return for the same.

The limits of this article will permit only a brief notice of the essential features of each of these divisions.

1. *Stage and Accessories.* — The stage must be deep, to give the perspective often necessary for fine effects, as well as to permit many scenes to be in readiness at needed points, it can hardly be satisfactory if less than eighty feet from the "tormentors" — or perhaps ninety-five feet from the footlights.

Its width will be governed not a little by the number of boxes and size of auditorium, but will probably be nearly a hundred feet.

It will have a deep cellar for disposing of scenery, as well as assisting in spectacular effects, and over the stage a rigging loft, etc., of great height for similar purposes, — spacious scene-rooms convenient to the stage will be indispensable for a considerable repertoire, as well as rooms for the varied branches that are allied to the Opera.

The rooms for the artists, musicians and employés will be simple, comfortable, well lighted and ventilated.

The orchestra will ordinarily be placed in front of the stage, as the leader needs to direct the forces on it as well as those immediately around him — but its pit should be sunk to such a degree that (with the exception of the leader) it does not intrude its writhing, restless members between the audience and the picture before them.

2. *The General Audience.* — The portions of the house devoted to it are the parquette and tiers above the boxes. They should be provided with spacious, comfortable seats (as opera performances are usually long), seats from twenty-two to twenty-four inches wide, and from thirty-seven to forty inches from back to back. The latter figure allows passage through the rows without great discomfort to sitters.

Spacious dimensions involve cost, but it must be remembered that Grand Opera is by no means an inexpensive affair.

The seating of the tiers probably cannot be as liberal from back to back, as it increases the difficulties of vision.

These difficulties require most careful study to make the naturally bad seats as good as possible; where they are decidedly bad it is better to remove them entirely, and use the space for standing room.

Another important provision for the audience is abundant and easy exits. If possible, these should be on three sides of the auditorium, so as to avoid crowding at a few points. Staircases should be built in towers, so that, were fires possible in any degree, they would protect from the noise, smoke, and element of panic. This leads to the further point — that of safety, and for this the building should be "fireproof," built almost entirely of masonry and iron, so that it should contain the least possible combustible material to feed a fire; it should be abundantly provided with water supply, and a very large iron tank at the most elevated part of the building (doubtless over the stage), to insure both the quantity and head needed.

The "automatic sprinkler," from which much has been expected when placed over the stage, has proved undesirable, as the pipes filled with water (to be in readiness to work automatically), are liable to freeze, and bursting, destroy the scenery underneath.

One more point should be touched upon in regard to the comfort of the audience — the ventilation. This must be done mainly by powerful machinery forcing large volumes of fresh and suitably-tempered air into all parts of the house. The products of gas combustion (if gas is used), should be drawn off, as far as possible, and not allowed to defile the air. In an ill-ventilated house the long performances toward the last are hardly endurable — and are invariably followed by headaches the ensuing day; surely, the late hours demanded by the performances are quite a sufficient tax for ordinary strength without the addition of blood-poisoning or fouling.

3. *The Accommodation of the "Box Holders" or Founders of the House.* — Each will have a box which gives a degree of seclusion while allowing a full display of the occupants. The boxes should command a good view, contain, without crowding, about six persons, and, to avoid disagreeable jealousies, be equally desirable in size, style, etc. Each box should have a small *salon*, or room opening out of it, to lay off or adjust wraps, etc., or to retire to if indisposed, or have a chat with friends, or partake of refreshments.

Broad corridors should connect all the several *salons* for easy access and interchange of visits.

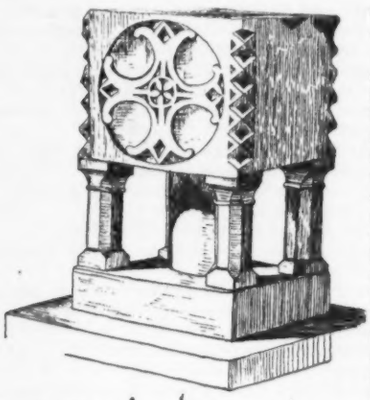
Large vestibules should be provided for those waiting for carriages — and covered driveways, that they may be reached without exposure.

A few words may be said upon the matter of style. After such a building as has been indicated has been planned, it will doubtless be found that there is little money left with which to make it "A Noble Work of Art," or "A Monumental Work." The great amount of solid masonry, the costly use of iron in unwonted forms and shapes,

[1] A paper was read by J. Cleaveland Cady, F.A.I.A., at the Twenty-first Annual Convention of the American Institute of Architects.

the large area of costly truss work, and the quantities of fireproofing, will rapidly consume the funds. Happy will it be if the architect acknowledges the situation frankly, and meets it in a simple manner; not doing some cheap and striking thing, or revelling in the latest architectural fashion which will shortly be despised; but following some honored and appropriate style, especially adapted to the economy he must exercise, treats the problem with a simple dignity that will not be tiresome or uninteresting as the years go by.

NICARAGUAN WOODS.[1]



Font, Twyford Church, Leicestershire.

THE woods of Nicaragua, grown under the sunny sky of the Torrid Zone, and in the mountains, valleys and on the sandy shores of the Atlantic and Pacific Oceans, are many in number and of widely different character in nature, strength and color. Unrestricted in their growth, in the exuberant and wild forests and woods of the country, they attain enormous sizes, and exhibit great strength and solidity. As a general rule, they are of delicate hues and beautiful colors, exhibit extreme fineness of grain and have marked peculiarities in texture and general appearance.

The investigation of their strength and natural properties is a matter of great interest. With the facilities offered in the Mechanical Laboratory of Sibley College for complete investigation of the materials of construction, I have thought it advisable to conduct such an investigation of a few of the Nicaraguan woods, so as to make known the characteristics, not only of those that have found their way into the markets of this country and of Europe, mainly because of their worth as dye-woods or for ornament, but also some others, perhaps of better, if not equally-prized properties, which have yet remained unknown in the industries.

In undertaking this investigation, I hope to find results which may prove of value and interest to the artisans of my native land, and also aid in developing, to a certain extent, the commerce and industries of Nicaragua, by making some of its natural products known in the United States and Europe.

I have restricted myself to the study of those woods which are most used in engineering construction and decoration, leaving out the dye and other woods, which, perhaps, may be of equal interest and value, there being quite as many unknown, or at least unused, valuable woods and plants of this latter kind.

I was encouraged from the start by Professor Thurston, who very kindly wrote to the Government of Nicaragua, asking for a collection of the most important woods of the country, expecting that its officials would take, or at least show, some interest, and thus secure a good collection of the woods. But, unfortunately, we were in this disappointed. It was by my father's interest, kindness and persistence, and through my friend Miguel Ugarte's active and courteous help, that I was supplied with as good a collection as could be obtained in the short time allowed to collect them. Steps were taken to get the woods, seasoned and sound, from persons engaged in working them, but they failed to obtain them. It is for this reason that the woods tested have not been entirely satisfactory, as they were cut green, and the men could not in most cases fell large trees to get the heart or the best of the wood; as a consequence, they checked on the way, and many of them were found to be knotty. The woods were collected in one month, within a circuit of three leagues, on the hills about Belen in the agricultural and chocolate-raising "Departmento" of Rivas, between Lake Nicaragua and the Pacific Ocean. Some few, obtained from a carpenter, are seasoned. My collection of fifty different varieties represents about half the number of the useful woods of the country.

GENERAL DESCRIPTION OF THE WOODS.

1. *Carbon.* — Extraordinarily solid, equalled only by the Piedra and the Quiebra-hacha. Is almost imperishable when used for posts, and is supposed to be very good for railroad ties. The tree attains a height of thirty feet, and measures twelve inches in diameter. Is common in most of the wooded districts. The wood is of a very fine grain, with peculiar dark streaks; very much like the mahogany in appearance and in color, but heavier and much handsomer. Is easy of working, and turns very smoothly.

2. *Cedro* (Cedar). — The wood, on account of its peculiar properties, has found a place in all the markets abroad. In Nicaragua it is found abundantly, and attains enormous sizes. Is used extensively for furniture, frames, book-cases, etc. It is even used by the Indians for boats, which they work out entire from the trunk of the tree.

3. *Chaperno.* — Dark red color, turns and planes very smoothly. It has a fine grain and great strength, and is susceptible of high polish. It is used extensively for cross-pieces of drawers and tables. Is extremely durable. There are two varieties of this wood, black and white, as they are called respectively. The tree attains a height of forty feet.

4. *Chiquirin.* — Dark yellowish wood, with a strong cedar smell. Is heavy, fine-grained, aud planes smoothly. The tree attains a height of thirty feet, and one foot in diameter. It has various uses, is durable, and having odor, is probably not subject to attacks by insects.

5. *Cortez.* — Extremely heavy and very fine-grained, of a very dark yellowish color. When broken in splinters, it gives off a fine yellow powder, which has similar properties to litmus; it turns bright red when mixed with soap water. It is a large tree like the Nacascolo. It is used in cabinet work, for framing, etc. The only place in which I can remember to have seen it growing is on a rocky hill at the foot of the volcano Mombacho, near the shore of Lake Nicaragua. The hill is covered with these trees, which, in the beginning of every spring, are a beautiful sight, being covered with yellow flowers.

6. *Granadillo-negro.* — Wood very much esteemed for interior decoration on account of its handsome dark color, fineness of grain, and ease of working. The tree attains a height of thirty feet, and is found on the shores of the rivers which flow into the eastern side of Lake Nicaragua.

7. *Gauchipilin.* — Fine-grained wood of a light-yellowish color, heavy and tough. The tree attains a height of thirty or forty feet, and has a diameter of fifteen inches. It is irregularly branched. Much used by the artisans for durable work, as it resists moisture for years. It is also used for telegraph-poles and railroad-ties. Is abundant all over the country.

8. *Guapinol.* — The tree is nearly as large as the Jenisero, and its branches large, but more erect. The wood is of a light mahogany color, long-grained, but very compact, heavy and tough. Is used almost exclusively for cylinders of sugar-cane mills, while the teeth moving them are made of guachipilin, guayacan or other similar wood.

9. *Guayabo de Monte.* — Attains a height of sixty feet, is of irregular diameter, and seldom over two feet above the lateral roots, acting as braces, which support the trunk. It has a fine grain and is very tenacious. The test made probably does not show full strength, as it was an inferior sample. It is used for small masts and the weather-streaks of boats. According to Mr. D. L. Murray, who preferred it above all others for launch-guards, it resists wear and tear better than any other wood.

10. *Guiliguiste.* — A wood unknown to commerce. Has a light-brown color in the heart, is fine and fibrous of grain. It ran above the average in compression. It is not as durable as the other hard woods, but from its beautiful grain and color, and from its ease of working, it would seem that it should be used for interior house-work. The tree is small, growing only about thirty feet high, with a diameter of fifteen to eighteen inches.

11. *Jenisero.* — One of the most useful trees, and one of the largest in the country. Attains a height of ninety feet, with seven in diameter, and its large branches cover a space of over one hundred feet in diameter. In Nagarote, a town in the Departmento de Leon, at the junction of one of its streets with the large road from the western departmentos, there is a jenisero whose branches cover a circumference of three hundred and forty-eight feet (about 9,498 feet area); it is ninety feet high, and has a circumference of twenty-one feet at four feet from the ground, according to Senor F. Guerreo Baster. The wood has a light to dark color and a peculiar grain; it is open and wide in the annual rings, but very compact between. It is used for cart-wheels, lasting for years without tires on clay soil. Used also by the carpenters in various ways. Its fruit is eaten by the cattle, and is used to sour the milk. It is fairly well distributed over the country.

12. *Jicaro-Sacaguacal.* — Attains a height of twenty feet, and a diameter from ten to twelve inches. Common on marshy land. It is of a nearly white color and very tough, used in saddlery and for boat-knees. Resists moisture and is durable in salt water. The shells of its fruits, after being worked, are used by the natives for drinking-vessels. They carve them very beautifully and artistically.

13. *Laurel.* — Dark color, light, strong and elastic wood and very easy of working. There are two varieties, male and female, as they are popularly called. Used mostly in frames for cots, and for work where elasticity is required. The dark kind is preferable. Both have a spicy smell. The tree attains a height of forty feet and a diameter from eight to twelve inches, seldom over eight.

14. *Lliqualtil.* — This is one of the trees having many peculiar natural properties. Its fruits have a rich fragrance and flavor, and when green give out a coloring substance. From its bark a bluish and sometimes a purple substance is obtained, and from its sap thirty per cent sugar may be obtained; is one of the most elastic woods found in Nicaragua. It is used for drum-hoops, canes, etc. The tree seldom attains a height of twenty feet, and about twelve inches in diameter.

[1] Description by Rufus Flint, M. E., included in a paper by Prof. R. H. Thurston, read before the American Association for the Advancement of Science, and printed in the *Journal* of the Franklin Institute.

15. *Madera-Negra.*—One of the most useful trees found in Nicaragua, not only on account of its durability, strength and excellence for firewood, giving out intense heat, but also from its method of growth. It is about the only tree used to shade the chocolate trees. It has a rapid growth, and is easily produced from the seed. Mostly used for railway ties, posts for houses, fence-posts, foundations, etc. Has a dark yellowish color in the heart, is fine-grained, heavy and tough. It grows with oblong cavities, wasting a good deal of the wood when being dressed. However, straight logs one foot square and thirty feet high can be obtained.

16. *Madrono.*—There are two kinds, white and dark. It has a fine grain and is heavy. Its strength may be seen from the tests in torsion and by transverse stress. Its growth is irregular and branching.

17. *Mahogany.*—This is too well known to demand description. In Nicaragua it is fairly-well distributed. The best and most valuable is exported to a considerable extent from the Mosquito territory, where it grows abundantly, and to its fullest size. It is also found along the Pacific Coast in considerable quantities.

18. *Moran.*—Solid and fine-grained wood of a beautiful yellow color. After it has been turned it looks as if it had been polished; planes very easily. It is exported in great quantities as a dyewood. Is often used for columns. Attains a height of from thirty to thirty-five feet and a diameter of from twelve to eighteen inches.

19. *Nacascolo.*—The wood is extremely heavy, very fine-grained, and of a handsome dark color. Its toughness is shown by the test in torsion. The fruit is known by the names of *Nacascolo* or *Dividi*, and used for dyeing purposes when dry. It is one of the largest of hard-wood trees. Its trunk, although irregular in growth, and seldom over twenty feet to the point where it branches, is six feet in diameter. It attains a height of sixty feet, and is found more abundantly on the Atlantic Coast. Is an excellent wood for railroad ties.

20. *Nancite.*—Has a soft pink color, fine grain, and works very easily. The tree is small, grows on arid hills, and seldom attains thirty feet height. Its bark is used for tanning, and its fruits are to the Nicaraguenses what cherries are to the North Americans.

21. *Nispero.*—It may be said that there are two kinds, wild and cultivated. Large fruit tree of a thick and handsome foliage. The trunk is straight and free from limbs. The tree attains a height of sixty feet and a diameter of two feet. It is abundant all through the country in farms near the towns and in the wild forests. Exclusively used for wharves, bridges and posts. Resists moisture equal to any of the hard woods, and is said to petrify in the water. The wood is of an exceedingly fine grain, has a beautiful red color, and is very easy working. It behaved the best of any under compression, bulging out considerably before showing any sign of shearing or split.

22. *Oja-tostada.*—Has a very light pink color, is fine-grained and light. It is one of the most elastic and tough woods tested, as may be seen from the tests by transverse stress and by compression. It is very good for light and strong constructions.

23. *Palo de Arco.*—The sample tested planed easily in parts, and in parts less readily, probably on account of being green. Is hard, has a fine grain, and a light red color. It is used for construction where easy of access. It grows along the coast and in the coast range of mountains, attaining a height of thirty feet and fifteen inches in diameter.

24. *Piedra.* (Stone).—Has a fine grain, is heavy and strong, of a yellowish color in the sap and deep red in the heart. Turns very smoothly, and is one of the hardest and heaviest woods known, and yet not difficult to turn or plane. The tree attains a height of forty feet, and has a diameter of from fifteen to eighteen inches. It is imperishable. Used in many places for pillars and transverse beams of houses on farms distant from towns where it is easy of access. Is abundant on the hills along the coast on the Pacific slope. There are two varieties. It is an excellent wood, not only for interior decoration or for heavy furniture on account of its beautiful color and fineness of grain, but also for heavy constructions, as for foundations for engines or heavy machinery.

25. *Pochote.*—Tree of enormous dimensions. The wood is similar to the cedar, but much softer. It is used, however, in house-work for doors, walls, floors, shingles, etc.

26. *Quiebra-hacha* (axe-breaker).—There are two kinds, red and black. The latter, which was tested in three ways, is a most wonderfully tough wood. It has a color and appearance like the black-walnut, and its grain is similar to that of the oak. It planes beautifully smooth, and has a pleasing appearance on account of its dark streaks. The red kind, which grows very straight and spreads considerably, reaches a height of fifty feet, and from twelve to fifteen inches diameter. The dark kind, which spreads still more, seldom attains a height of forty feet. Their name, axe-breaker, indicates their toughness, for in cutting or felling them the axe is often broken. In cutting the samples received, two axes were nicked to the extent of one-half to three-fourths of an inch. The wood is durable and used for ties, poles, etc., and in posts for houses. One piece that had been for sixty-seven years in a clay soil was found still sound when sawed. The tree is common throughout the State.

27. *Quita-Calson.*—Its powder acts as a purgative. The tree attains a height of thirty to thirty-five feet, branching at fifteen or twenty feet from the trunk, and often has a diameter of two feet. It is abundant along the coast. It is used for boards where not exposed to the weather; it will not resist moisture.

28. *Roble.*—Light-colored wood of a curly and beautiful grain. It is pink in color and used in house-building. The tree has exceedingly large leaves, fourteen inches long and about seven inches wide, is often fifty feet high, and from twelve to fifteen inches diameter. Is abundant along the coast.

29. *Ron-ron.*—This is one of the largest of hard-wood trees growing on the shores of the rivers of the Departmento of Chrontales on the Atlantic slope. It reaches a height of fifty or sixty feet, and often a diameter of three feet. Dark, fine-grained wood, strong, heavy and durable. Is used in cabinet work, turns very easily, and is susceptible of polish. It turns dark with age.

30. *Tempisque.*—This tree is of historical interest in Nicaragua, and is one of the largest found in the tropical forests. It attains a height of seventy-five feet or more. The trunk is irregular and seldom reaches twenty feet to the beginning of the largest branches. It has a diameter of six feet. The wood is fine-grained, hard, and very excellent for desks and other articles of cabinet-work. Like the mahogany it turns dark in a few years, and is equally durable. The cattle eat its fruit.

31. *Tiguilote.*—Light wood, grows about thirty feet high, and over twelve inches in diameter; good wood for carriages. It is used for fence-posts; it easily roots when set with care, thus making a permanent fence and a pretty grove.

32. *Zapotillo.*—Of a light mahogany color, has a fine grain, and is light. Attains a height of forty feet and one foot in diameter. It is not very much used.

33. *Zopilote* (Buzzard).—Coarse, long-grained wood, but of compact layers when viewed in cross-section. It has a greenish color. Turns and planes fairly well. The wood is used only in neighborhoods where more useful woods are scarce. When unexposed or when well seasoned and protected with paint, it would probably be a valuable wood, as it ran above the average in torsion, was among the highest in compression, and stood well under transverse stress. It attains a height of about forty feet and one foot in diameter.

THE ENGINEERING FEATURE OF THE NICARAGUA SHIP CANAL.[1]

A Roman Fragment, — the Museum at Dijon

THE Nicaragua Canal is known by name, probably, to a majority of persons in this country; but the revised route, the enlarged capacity and the new features presented as the result of the last survey, made two years ago by the United States Government expedition in charge of Civil Engineer Menocal, U. S. N., are not so well known, and of them I will speak. The distance from ocean to ocean by the proposed route is 169.8 miles. Of this distance, however, only 40.3 miles are actual canal, the other 129.5 miles being free navigation through Lake Nicaragua, the Rio San Juan and the valley of the San Francisco. Beginning at the port of Brito on the Pacific side, the canal ascends the valley of the Rio Grande by four locks, and cutting through the low divide enters Lake Nicaragua 17.27 miles from Brito, at an elevation of 110 feet above the sea. The route then extends across the lake, which is 40 miles wide and over 90 miles long, to its outlet into the Rio San Juan, a distance of 56½ miles. Then down the broad, deep reaches of the majestic San Juan to the dam, 64 miles from the lake. This dam, 1,255 feet long and 52 feet high, backs the water of the river the entire distance to the lake, and makes it simply an extension of the lake. On the north bank of the river just above the dam, a short section of canal, less than two miles long, cuts through the hills into the Y-shaped valley of the Rio San Francisco lying north of the San Juan and separated from it by a range of hills. An embankment, 6,500 feet long and 51 feet high in the centre, built across the stem of the Y, floods this valley to the level of the water above the dam, and makes about ten miles of lake navigation. At the eastern end of this lake commences the eastern division of this canal, and pierces the divide by a cut 14,200 feet long, and averaging 149 feet in depth. At the eastern end of this cut is the upper lock of the Atlantic flight, and from here the canal descends the valley of the Deseado by three locks to the sea level, and stretches across the lagoon region back of Greytown to the harbor, 11½ miles distant. From the last lock to Greytown, the same as at Brito on the west side, the canal is enlarged, forming an extension of the harbor 11½ miles inland. The lake and the river must form a part of any and every canal route through Nicaragua, and the location as a whole is the result of Civil Engineer Menocal's complete and exhaustive personal knowledge of the entire country from ocean to ocean, gained in the course of eight different surveys, extending over a period of fifteen years, and supplemented by a conscientious study of all that has been done by others in that region.

Of the 40.3 miles of actual canal, about 27 miles will be excavation pure and simple, while the remaining 13 miles will be largely, if not entirely, excavated by dredges. With the convenient dumping-ground for earth excavated, with a large portion of the rock from the

[1] Abstract of paper read before the American Association for the Advancement of Science, at the New York meeting, by Civil Engineer R. E. Peary, U. S. N.

summit cut utilized close at hand in the construction of the locks, the dam across the Rio Grande, and in pitching the slopes of the canal, and a still larger quantity to be consumed in the construction of the breakwaters at Brito, the work in this section admits of the most economical execution. The divide-cut from the basin of the San Francisco to the upper lock, 14,200 feet in length, and with an average depth of 149 feet, is, it is admitted, a very serious job; but with the neighboring streams offering water at a high head for removing the surface-earth by hydraulic mining, with a large plant of power-drills worked by compressed air, from the same source, and the use of modern explosives to remove the rock, with a large proportion of the excavated rock to be used in the construction of the locks and the dam, and in pitching the slopes of the canal, and a still larger quantity utilized in the construction of the harbors at Greytown; with the laborers above the miasma and mosquitoes of the swamp and exposed to the pure breath of the trade winds, the work can be done without serious difficulty.

There are two features of this project which, to many who have not made such structures a study, cause a question of safety to arise; one is the dam, which at one stroke gives us 64 miles of river navigation, and the other is the embankment, which, at a second stroke gives us over eight miles of lake navigation, and completely solves for that portion of the canal from the dam to the divide (13 miles) the important problem of protection from surface drainage; but neither of them are anything more than small affairs when compared with many others scattered about the world, and serving much less important purposes than the ones under consideration, and beside the Quaker Bridge Dam they are pigmies. Right here at the Croton reservoir is a dam which is to-day standing twice the strain that either of them will ever be called upon to resist. The locks are to be magnificent structures of concrete, 850 feet long, 80 feet wide and 30 feet deep, capable of containing any merchant vessel afloat, except the *Great Eastern* and possibly the *City of Rome*. The necessary machinery for moving the locks and culvert gates, for hauling the ships in and out of the locks, for electric lights and other purposes will be worked by hydraulic power furnished by the locks themselves.

In regard to the general question of locks, the late Ashbel Welch and the late John G. Stevens are quoted at some length in favor of their use.

Much has been said about the harbors at the termini of the Nicaragua route, and neither time nor space will permit me to enter into the discussion here. It may be said, however, that there is no practical route for a canal across the American Isthmus that has good harbors, and it is believed that those at the termini of the Nicaragua Canal can be made first-class at less cost than those of any other route. There is nothing more difficult in the improvement of Brito Harbor than has been successfully accomplished at numerous French and English breakwater-protected ports and harbors, and the maintenance of the harbor of Greytown will be a much less serious job than is the maintenance of the Port Said entrance of Suez, with the enormous salt discharge of the Nile driven across its mouth by strong littoral currents.

Lake Nicaragua has a surface area of some 2,000 square miles, and a drainage area of not less than 8,000 square miles, and the Rio San Juan, its only outlet, discharges at its lowest stage, near the close of the dry season, eight times the maximum supply required by the locks. An inexhaustible supply of the best building material, such as lime, natural cement, stone and timber, can be obtained on the line of the canal, and with an abundance of palm leaves for thatching such temporary buildings as are required for the accommodation of the working force and the protection of property can be constructed at little more expense than that of handling the material.

At Suez the traffic has been seriously delayed by the dimensions of the canal and the inadequate number of the turnouts. In the present project not only have enlarged prisms been provided for, but larger basins are proposed at the extremities of the locks. These basins, the enlargement of the canal at each end, with the lake, the river and the San Francisco Basin, will permit vessels to pass each other without delay at almost every point on the route. In 22.37 miles, or 57 per cent of the canal in excavation, the prism is large enough for vessels in transit to pass each other, and of a sectional area in excess of the maximum area in the Suez Canal; the remaining distance in which large vessels cannot conveniently pass each other is so divided that the longest is only 3.67 miles in length; that, with two exceptions, those short reaches of narrow canal are situated between the locks, and can be traversed by any vessel in less time than is estimated for the passage of a lock; consequently, unless a double system of locks be constructed, nothing will be gained by an enlargement of the prisms. In the lake and in the largest portion of the San Juan River vessels can travel almost as fast as at sea. In some sections of the river, and possibly in the basin of the San Francisco, although the channel is at all points deep and of considerable width, the speed may be somewhat checked by reason of the curves.

ESTIMATED TIME OF THROUGH TRANSIT BY STEAMER.

	H.	M.
38.98 miles of canal, at 5 miles an hour	7	48
8.51 miles in the San Francisco basin, 7 miles an hour	1	14
64.54 miles in the San J an River, at 8 miles an hour	8	4
56.50 miles in the lake, at 10 miles an . our	5	39
Time allowed for passing seven locks, at 45 minutes each.	5	15
Allow for detention in narrow cuts, etc.	2	00
Total time	30	00

The experience of the Suez Canal shows that the actual time of transit is more likely to fall under than to exceed the above estimate. The traffic of the canal is limited by the time required to pass a lock, and on the basis of forty-five minutes (above estimated) and allowing but one vessel to each lockage, the number of vessels that can pass through the canal in one day will be 32, or, in one year, 11,680; which, at the average net tonnage of vessels passing the Suez Canal, will give an annual traffic of 20,440,000 tons. This is on the basis that the navigation will not be stopped during the night. The estimate of the total cost of the canal is $64,043,699, which sum includes 25 per cent for surveys, hospitals, etc., and contingencies. The completion of the canal will require six years, one for final location and five for active work of construction, and the probable traffic for 1892, the possible date of completion of the Nicaragua Canal, is 6,506,214 tons.

COMMUNICATIONS

THEATRE PROTECTION.

BOSTON, MASS., October 24, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—I happened to be in Europe at the time of the burning of the Theatre Comique, in Paris, immediately after which I was asked to explain the working of automatic sprinklers, with a view to their adoption in theatres. A little later the terrible disaster happened at Exeter, presenting a case in which certain safeguards, which are a common rule in factories, might have prevented the terrible loss of life.

The question of immediate importance seems to me this: *How can existing theatres, which cannot be reconstructed, be made safer than they are?*

Referring to the minute account of the disaster at Exeter, you will observe that immediately after the fire took place and before the people in the gallery had even begun to make their escape, the curtain bulged outward toward the auditorium, and the flame and smoke, passing by the curtain at the side, filled the upper part of the auditorium and suffocated large numbers of persons in the gallery.

These conditions indicate the lack of one of the safeguards formerly wanting in factories and warehouses, but now in almost universal use, especially over the elevator-shafts; to wit, a window in the roof glazed with the thinnest kind of glass, with a view to its being broken at the very first contact of the heated air from the fire below, even before the fire has reached the upper story, so that the elevator-shaft may serve as a flue to draw sparks, flame and smoke coming up from the basement, *away from the upper rooms;* without this provision the ordinary tight roof turns the heat and flame inward, and spreads the conflagration through the upper story.

Would it not follow that every theatre should be furnished with a large skylight, or it might even be a very large open ventilator inside the arch which is between the stage and the auditorium and directly over the front of the stage? The glass being broken by the heat, this would give an outlet to the smoke and flame of the burning stage, and would draw fresh air *into* the auditorium from the open doorways.

It would be possible to construct a large trap door, held in its place by fusible solder, which will resist a pressure of 500 lbs. to 1,000 lbs. per square inch, but will yield at a heat of 160° Fahrenheit.

Is it not true that however ample and adequate the stairways may be, an accident like that which occurred at Exeter—namely, the upsetting of the ticket-taker's table and box—will trip some of the audience up, cause a temporary block, and thus create a danger under any circumstances and conditions?

An iron curtain is much relied upon. According to our experience, while it might possibly remain unwarped long enough to permit an audience to escape, even that is doubtful. The heat from the contents of a burning stage is very sharp and sudden and would be more liable to twist and warp the iron curtain *before* the audience has escaped, than to hold the flame until they had gone out.

From our recent experience with the automatic sprinkler properly arranged, all who are conversant with factory risks would have little doubt that almost any stage could be made safe; that is to say, by the action of the sprinklers the fire could be held long enough to permit an audience to escape from any theatre of those which are least adequately furnished with stairways. Experience with this apparatus now covers so many cases of dangerous fires, stopped with little or no loss, as to give increased confidence in the security afforded by it.

In my judgment, the adoption of an automatic sprinkling system ought to be made a condition of the license and a part of the Police Regulations for every theatre, however constructed, no matter how ample the exits may be.

EDWARD ATKINSON.

SOLID TIMBER FLOORS.

NEW YORK, October 24, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—Anent the Holbrook Hall floor failure, Mr. R. G. Hatfield, in the 1877 issue of "*Transverse Strains*" gives formulæ in Article 702 for the elements of solid timber floors.

It might be interesting to know whether any one else has had experience with solid timber floors for resisting fires because of the early failure of light iron beams, due to rust, and the consequent expense added for heavier construction. Is it impossible to so construct a solid timber floor as to obviate dry rot?

Yours respectfully, Geo. Martin Huss.

NOTES AND CLIPPINGS

Blowing-up Chimneys. — An interesting scene was caused recently by the blowing-up of the two immense chimneys on Borsig's Machine Works in Berlin. A large number of spectators were present to witness the ceremony, including several officers of the army, the trustees of the Borsig estates, and the employés of the works. Punctually at five minutes past six, P. M., the signal to "Look out!" was given; then came the word of command "Fire!" and at this moment the vast chimney, towering to a height of say 120 feet 9 inches, quietly collapsed. The noise occasioned by the fall was not very great, ditches two metres in breadth having been dug all round the chimney and filled with straw. For blowing up this colossus, which consisted of 98,000 bricks and was topped with a heavy iron cap weighing twenty-five centners, only 24 kilos of dynamite were employed. Photographs were taken of the chimney before it fell, and also as it was in the act of falling, by an officer of the Commission for Experimenting with Explosives. The second chimney, standing about 80 feet high, was blasted with gun-cotton, of which 35 kilos were required.

Bamboo Tree. — Writing from China, a correspondent says that the Chinese have developed the culture of the bamboo tree very wonderfully. They can produce a perfectly black as well as a yellow bamboo. The emperor of China has one officer whose duty is to look after his bamboo gardens. This valuable tree is found in all tropical and subtropical regions, both in the eastern and western hemispheres. An attempt has been made in England, and with some success, to raise a dwarf species found at an altitude of 12,000 feet in the Himalaya mountains. The new world furnishes bamboo of the greatest diameter. The stems are usually very slender, but in the northwestern part of South America is found one species with a diameter of 16 inches. The Chinese put this plant to a greater variety of uses than any other people. Some kinds of it when it first shoots up from the ground are used as a vegetable as we use asparagus, or it can be pickled in vinegar or made into delicious sweetmeats. The plant has to be 30 years old to blossom, and then it bears a great profusion of seeds and dyes. These seeds may be used like rice, and a kind of beer may be made from them. In 1812 severe famine in portions of China was prevented by the sudden blossoming of a great number of bamboo trees. The stems of all the varieties are remarkably salicious. One kind found in Java is so hard that it strikes fire when the hatchet is applied to it. This has only a very slender stem, which is polished and used as stems for tobacco pipes. This protean tree furnishes material for houses, boats, cordage, sails of boats, telescopes, aqueduct pipes, water-proof thatching, clothing, water-wheels, fences, chairs, tables, bookcases, boxes, hats, umbrellas, shields, spears, and paper. The pith is used for lamp-wicks, so there is no part of it that can not be used for something. From some of it exquisite carvings inlaid with gold and silver are cut, that exceed in beauty the ivory carvings for which the Chinese are so famed. Recently it has been put to another use. Mr. Edison has found that the carbonized fibres of the bamboo furnish the best material for the incandescent electric lamp and has made use of it in his system of lighting. In Burmah and Siam whole cities are built from bamboo. These houses are made in pieces, lashed together, and raised on posts several feet high. — *The Lumber World.*

Hardening Plaster-of-Paris. — The following information on this subject, supplied by a correspondent of the *English Mechanic*, may prove of interest: Among the methods of hardening or toughening plaster-of-Paris those recommended most frequently are the use of alum in the water, or a decoction of marsh mallow. Some, however, use gum or glue; but in every case the plaster takes longer to set, and it will probably be found that the addition of a little sulphuric acid to the mixing water is all that is necessary. If a strong stucco is required, the plaster should be made into a *magma* with a solution of glue, which should not be concentrated. The mass requires a longer time to set than when pure water is used for mixing; but the mass becomes harder in the end. If the cast is to remain white, colorless glue or gelatine must be used. Regarding borax, various authorities differ in the proportions and method of its use. Thus one writer says that the crude pieces of burned gypsum should be saturated with a solution of borax, again burned for six hours, and then ground. A still better effect is said to be obtained with borated gypsum by taking the *magma* for casting with the aid of a cold saturated solution of cream-of-tartar. Michaelis criticises the proportions of borax and cream-of-tartar quoted by others, inasmuch as they are directed in larger quantity than cold water would dissolve; while, on the other hand, gypsum should not be made into a *magma* with a hot solution. He therefore believes that if these additions are really useful cold saturated solutions would be all-sufficient. If burned gypsum in lumps is placed in a saturated solution of alum, afterward dried in the air, and again burned at as low a heat as possible, the resulting powder, particularly if mixed to a *magma* with a solution of alum, will yield very hard casts. The same result can probably be obtained by intimately mixing finely-powdered plaster-of-Paris with about two per cent of burned alum, likewise in very fine powder, and making the *magma* with water. The addition to the water of a little solution of silicate of soda (not prepared from the thick or gelatinous variety, but from the clear, syrupy solution), will probably aid the setting. When a cast has been made, the best way to harden it is to warm the cast to about 170° Fahrenheit, and then to quickly brush it over with a glass brush dipped in a hot saturated solution of caustic baryta, which must be carefully kept from the air until it is to be applied. The bartya will sink into the pores of the external layer of the cast, absorb carbonic acid from the air, and form carbonate of barium, which increases the density and hardness. A mixture of plaster-of-Paris with powdered anhydrous borax would perhaps answer the purpose likewise. Possibly by taking a dilute solution of shellac and borax in water for making the *magma* a satisfactory result may also be obtained.

TRADE SURVEYS

The rule by which speculators determine the degree of prosperity throughout the country is not the rule which producing interests can safely adopt. For months past speculation of every kind has come to grief, while legitimate industry has been prospering. It seems as though the conditions arrived at render pure speculation almost an impossibility. Corners of every kind have failed. The only hope for success is in the scarcity of money. The action of the Government in buying bonds is everywhere regarded as a wise thing to do in order to protect business interests. There is another view of this question. If there is not enough money in circulation to supply absolute requirements of business, a system should be established which would supply enough. This is the commonsense view of the matter. A financial stringency will always hover around the financial world until a wise and comprehensive system is devised and established. Speculators and banking interests, as well as individual money-lenders, may be satisfied with the existing arrangements, because it offers them more frequent opportunities of lending money at exceptionally high rates of interest. The business and industrial interests of the country demand the lowest possible rate and a regularity which our existing system cannot guarantee. This fact is acknowledged by the most careful thinkers, but no remedy has, as yet, been suggested, which will secure a uniform or elastic volume of currency. Supply and demand ordinarily regulate themselves. Money is an exception. It is largely a matter of legislation. The exigencies which created our existing system have passed, but the fruits of that system still remain, and the rapidly-expanding industrial interests are obliged to conform to the monetary system in which they find themselves. Our leading financial authorities intimate that this is one of the coming issues, but prefer to defer a discussion of that issue until it cannot be any longer avoided. Opposing theories differ as to the wiser policy concerning the monetary system. Some demanding a gold basis, others a mixed gold and silver basis, and others an exclusive or partial paper basis, but meanwhile the country is expanding in railroad construction, in business of all kinds, and in population, and its necessities for more money are of such a character that the demand cannot be quietly ignored. The Government may buy in its ten or twenty millions of bonds with greater or less frequency, but this is only prolonging a dangerous policy. The expansion of the currency, within the past fifteen months, has been over $100,000,000, and but for this, say the advocates of increasing volume of money, a panic would have occurred. Those whose opinions are based upon an exclusive gold basis, or gold and silver basis, want to say that the country would have been even better off had that basis been adopted. Everything points to the greater necessity for an international monetary understanding, but while Great Britain stands isolated in its opposition, it is an impossibility to agree upon a basis which will be accepted by all of those whose consent is necessary. This long debated question will never receive a solution until circumstances compel it, and nothing but a radical change in the economic and commercial conditions and relations of two or three of the leading powers will bring about a change. While Great Britain holds commercial supremacy on the seas, it is not to be expected it will agree to accept a position that that Government has heretofore strenuously opposed. The continental idea of a monetary basis would become a generally adopted one but for the opposition or indifference of Great Britain. In the United States a lack of understanding of this vital question is now causing more or less indifference. Reference is made to this much-talked-of question simply because it is a question which will soon force itself into prominence. The business and manufacturing requirements of this country are two features, or rather one, which will necessitate the establishment of an international basis. Our export interests are steadily growing. In a short time our commercial relations with foreign countries will be more intimate. A tariff agitation in the United States is in sight. A reduction of duties upon many now-taxed articles is probable. The farmers of the West are taking stronger ground in favor of lower duties than they ever have done. Even manufacturers of the East are disposed to recognize that in some particulars at least a modification of our tariff system would be beneficial. This tariff, or modification of duties, is intimately connected with a better monetary international system. There is no doubt but numerous interests would be hurt at the outset, but it must be admitted that advantages would accrue from another revision of tariff duties. The country is in a transition state from high to lower duties. The great question is now, how to adjust these duties so as to develop our export trade without injuring our domestic trade or industries. All of the industries throughout the country continue in a most active condition, and it might, perhaps, be better to let well enough alone rather than to introduce disquieting agitations and jeopardize development, which is now progressing so satisfactorily. The farming and cotton-growing interests of the country are prosperous, and a great addition will be made to the agricultural area next year. Manufacturing and agricultural interests have kept themselves quite evenly balanced during the past twelve or twenty-four months. Our development is leading us into unexplored fields, and our prosperity is a constant surprise. Policies and measures seem to suggest themselves rather than to be suggested. No dangerous issues are before us. The money question and all other questions will, after all, settle themselves. It will be simply a matter of dollars and cents rather than of politics when this and all other questions come up for decision. The decentralization of industries, which has been going on in the South and West within the past few years, has changed the condition of our industrial development, and made things possible which were a few years ago impossible. It is not at all probable that railroad building will fall off as so many are predicting. It is probable that our export trade will readily expand, that manufacturing enterprises will multiply, that house and shop building will continue at the rate of the past two or three years, and that the supply of money will be equal to the demands. It is, therefore, useless to borrow trouble or to endeavor to foresee disaster. At the same time, it is possible and probable that this extraordinary activity will rush into overproduction within two years, and a necessary reaction then set in. Meanwhile, industries will increase, prices will remain firm, production will be continuous, and the growth of wealth will help to stimulate a multitude of enterprises in all of the newer sections of the country.